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ABSTRACTS

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**2020 SYMPOSIA****SYM1A****HEATED TOBACCO PRODUCT USE AMONG SMOKERS AND VAPERS: FINDINGS FROM THE 2018 ITC 4 COUNTRY SMOKING AND VAPING SURVEY**

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Background: The emergence of heated tobacco products (HTPs), with active marketing campaigns in more than 40 countries, has further diversified the global tobacco product market. However, little is known about concurrent use of HTPs among users of other tobacco products. We evaluated the prevalence of HTP use among adult combustible cigarette (CC) smokers and vaporized nicotine product (VNP) users across four countries. **Methods:** The analytic sample (n=12,987) consisted of current or former CC smokers and current VNP users from the United States (US), Canada (CA), England (EN), and Australia (AU) enrolled in Wave 2 of the ITC Four Country Smoking and Vaping Survey. Only CA and EN had legalized sale of HTPs at the time of survey (2018). Country-stratified cross-sectional analyses estimated the weighted prevalence of past-month HTP use overall and according to past-month CC and VNP use status. Secondary analyses classified concurrent CC+HTP users into predominance categories according to frequency of use (daily v. non-daily). Due to limited HTP use in AU, detailed analyses were restricted to US, CA, and EN. **Results:** Prevalence of HTP use was 0.9% in the US, 1.2% in CA, 1.6% in EN, and 0.3% in AU ($p < 0.001$). A large proportion of HTP users reported concurrent poly-use of HTP+CC+VNP (US=64.4%; CA=44.5%; EN=60.5%; $p=0.16$), followed by concurrent HTP+CC use (US=11.0%; CA=30.6%; EN=22.7%; $p=0.25$) and concurrent HTP+VNP use (US=24.6%; CA= 15.1%; EN=16.8%; $p=0.68$). Irrespective of CC smoking, country-level differences in concurrent HTP+VNP use were observed ($p=0.04$). Most concurrent HTP+CC users (including those who used VNPs) reported CC smoking on a daily basis (US=71.2%; CA=80.6%; EN=78.6%; $p=0.69$), the majority of which were non-daily HTP users (US=57.6%; CA=58.6%; EN=61.2%; $p=0.94$). **Conclusions:** In the US, CA, and EN, HTP use was frequently accompanied by concurrent smoking or vaping. Continued surveillance on the influence of regulation of other tobacco products to HTP user profiles is warranted. High levels of daily smoking among HTP users demonstrate the importance of examining whether HTPs sustain smoking, or serve as a long-term replacement product.

FUNDING: Federal; Academic Institution

SYM1B**DEVICE BRAND AND FLAVOR PREFERENCES AMONG USERS OF HEATED TOBACCO PRODUCTS IN JAPAN: FINDINGS FROM THE 2018 ITC JAPAN SURVEY**

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Significance: Heated tobacco products (HTPs), such as IQOS, glo, and Ploom TECH, with variety of flavored tobacco-containing inserts (e.g. sticks, cartridges, capsules) have been introduced into Japan as the testing ground for the global tobacco product market. Although HTPs have achieved significant market share in Japan, little is known about the prevalence of HTP use, characteristics of HTP users, and users' preference for HTP device and flavor. **Methods:** Data were analyzed from the Wave 1 of the ITC Japan Survey, a nationally-representative web survey conducted in February/March 2018 among 4,729 participants aged 20 and older. Weighted prevalence for current HTP use (daily, weekly, or occasional use), device brand and flavor preferences, and reasons for device choice were computed. **Results:** The overall prevalence of current HTP use was 7.7% (95%CI=6.2-9.3), comprising 1.7% of daily use, 0.4% of weekly use, and 5.6% of occasional use. Among current HTP users, 2.7% were never smokers. The majority of current HTP users smoked (83.7%), with most dual users being daily smokers and non-daily HTP users (37.5%). Average age of current HTP user was 40.3±1.3 years compared with an average age of 46.5±0.9 years of current smoker ($p<0.05$). Similar to cigarette smoking rates, HTP use was more prevalent among men (75.6% and 77.6%

users were male, respectively). IQOS was the most prevalent device among current HTP users (72.7%), followed by Ploom TECH (13.2%), and glo (12.9%). Younger respondents had greater odds of reporting IQOS use, while Ploom TECH was more popular among older respondents. Menthol (36.4%), tobacco (30.5%), and mentholated fruity (15.1%) were three most prevalent flavors among current HTP users. The most common reason for choosing IQOS was use by friend (79.6%) while for glo and Ploom TECH was a perceived reduction in health risk compared to smoking (62.5% and 61.5%). **Conclusion:** The prevalence of current HTP use in Japan is substantial with the IQOS device and menthol flavor being the most preferred. Findings improve understanding of the patterns of HTP use, which can inform future public health interventions.

FUNDING: Federal; Academic Institution

SYM1C**EXPLORING SMOKERS' AND EX-SMOKERS' USE OF IQOS: A QUALITATIVE STUDY OF IQOS USERS AND EX-USERS IN LONDON, UK**

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Significance: IQOS distribution is expanding and the US FDA recently authorized it for marketing. However, there is a lack of independent research exploring initiation and any subsequent use among smokers and ex-smokers. We explore (1) reasons that smokers and ex-smokers use and continue/discontinue IQOS, (2) harm perceptions, and (3) consider implications for research and policy. **Methods:** Qualitative in-depth interviews in London, UK with adult (18+) current (n=22) and ex-users (n=8) of IQOS who either currently smoked or quit smoking in the last two years. **Results:** Smokers' and ex-smokers' use and continued use of IQOS was influenced by their desire to reduce/quit smoking cigarettes, and reduced harm perceptions of IQOS, which were enhanced by optimism with the understanding that IQOS was not risk-free. Optimism about harm was influenced by IQOS being produced by PMI. Branded white packaging, and the absence of pictorial warnings conveyed reduced harm relative to smoking, as did physical health improvements. High start-up costs were off-putting but cheaper ongoing costs encouraged use. There were mixed views on enjoyment and satisfaction. Sensory experiences influenced continued use including discreetness, cleanliness, and reduced smell, relative to both cigarettes and e-cigarettes. The sensory experience of using also conveyed severity and location of harm, e.g., mouth but not lungs. Accessibility of HEETS and the need to maintain the device limited use, leading to situational use of ordinary cigarettes, while ease to use undetected or in non-disruptive ways in smoke-free places increased use. Similarities in rituals and routines relative to smoking encouraged use, including start and end point of HEETS. Some liked trailblazing new technology. Use improved social interactions/close relationships but limited shared social experiences with smokers for some. **Conclusion:** No one factor took precedence, suggesting the importance of the entire IQOS experience relative to smoking. Some factors deterred situational use, but not overall use. Packaging, labelling, risk communication, taxation and smoke-free policies, appear to influence initiation and continued use.

FUNDING: Nonprofit grant funding entity

SYM1D**EXPOSURE TO NICOTINE AMONG USERS OF CIGARETTES, ELECTRONIC CIGARETTES, AND HEATED TOBACCO PRODUCTS**

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Background: There is lack of evidence from independent studies whether nicotine intake from emerging heated tobacco products (HTP), such as IQOS differ from other tobacco products. This study examined biomarkers of nicotine exposure among exclusive and poly-users of IQOS, users of other HTP brands (Ploom TECH and glo), combustible cigarettes, and e-cigarettes. **Methods:** Data were from the ITC Japan-Canada HTP Survey. Spot urine samples were collected by mail from 544 adult daily tobacco users in Japan and Canada, and were analyzed for two primary nicotine metabolites (cotinine and trans-3-hydroxycotinine) using mass spectrometric methods. Creatinine-adjusted Total Nicotine Equivalents (TNE-2) were calculated by dividing the molar sum of urinary



cotinine and 3HC by creatinine concentration. Cross-sectional analyses assessed mean concentrations of TNE-2 across the following daily tobacco use groups: non-users (n=140), exclusive smokers (n=127), exclusive e-cigarette vapers (n=27), exclusive IQOS users (n=75), exclusive users of other HTP (n=55), concurrent smokers and vapers (n=46), and concurrent smokers and IQOS users (n=74). Post hoc pairwise-comparisons examined potential differences in mean concentrations of nicotine metabolites across product use groups. Results: Aside from non-users, no statistically significant differences were observed in biomarkers of nicotine exposure between all categories of tobacco users. Mean TNE-2 concentrations were: exclusive IQOS users=34.22 nmol/mg creatinine (95% CI: 27.27-41.17), exclusive smokers=35.01 nmol/mg creatinine (95% CI: 27.68-42.36), and exclusive vapers=18.61 nmol/mg creatinine (95% CI: 10.09-27.13). Average TNE-2 concentrations from concurrent smokers and IQOS users did not differ from exclusive users, and were similar to values measured from concurrent smokers and vapers (31.88 nmol/mg creatinine (95% CI: 23.57-40.18) vs. 27.61 nmol/mg creatinine (95% CI: 17.29-37.94), respectively). Conclusions: Results suggest that daily use of HTPs exposes users to doses of nicotine similar to daily smoking and daily vaping. Multiple product use was not associated with increased nicotine intake.

FUNDING: Federal; Academic Institution

SYM1E

THE EFFECT OF TAX ON IQOS AND CIGARETTE PURCHASES IN JAPAN

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Introduction: The introduction of a new heated tobacco product, IQOS, has reduced cigarette sales in Japan. In October 2018, Japan introduced an excise tax on IQOS and increased the excise rate on cigarettes, which resulted in higher prices for both products. The impact of product prices on IQOS use has not been previously examined. Methods: The study compares patterns in sales of cigarettes and IQOS heated tobacco units (Marlboro and Heets heat sticks) before and after the 2018 tax increase in Japan to better understand how the use of the two products depends on the relative prices of the products. We use 2014 to 2019 monthly retailer panel, shop-scanner data from 11 of Japan's 12 geographical regions (n=616). The method involves panel data analysis through seemingly-unrelated regressions (SUR), a method allowing for the error terms from regressions for cigarettes and IQOS sales to be correlated. The primary outcome variables are IQOS and cigarette demand elasticities, which measure the products' sensitivity to price. We control for likely covariates, such as income and seasonality of sales. Results: After the 2018 tax increase, both cigarette and IQOS sales dropped beyond what could be explained by previous sales trends alone. The impact of tax on IQOS sales was alleviated by introduction of Heets, a new, less-expensive IQOS heated tobacco brand. In the unadjusted models, the estimated own-price elasticity for IQOS indicates that the product demand is highly elastic (elasticity < -1), while the demand for cigarettes is unit elastic (elasticity = -1). The estimates from adjusted models are ongoing. Conclusions: Our findings affirm that IQOS use is highly responsive to price increases, such as through taxation. Moreover, the demand for IQOS is much more price responsive than the demand for regular cigarettes. The study assists in better policy development, including in jurisdictions where these heated tobacco products are just entering or will enter the marketplace, such as the US.

FUNDING: Federal

SYM2A

SEX DIFFERENCES IN THE NEURAL SUBSTRATES OF CIGARETTE CRAVING, WITHDRAWAL, AND RELIEF

Maylen Perez Diaz, PhD. UCLA.

Compared to men, women have more difficulty maintaining long-term abstinence from smoking, report greater craving and withdrawal during abstinence, and greater relief after smoking. Yet the neural mechanisms driving sex differences in these behavioral states remain unknown. Understanding these differences can inform the development of personalized smoking-cessation therapies. Previous studies suggest that brain glutamate concentration may differ between men and women, and may play a key role in smoking-related behaviors. We tested for sex differences (N=13 men, 9 women) in (1) the effects of acute smoking after overnight abstinence (~12 hr) on glutamate levels (Glu) in the dorsal anterior cingulate cortex (dACC); and (2) the relationship of dACC Glu with cigarette craving and withdrawal after overnight abstinence and after smoking. To elucidate the role of ovarian hormones on these sex differences, we evaluated the relationship between plasma concentrations of estradiol and progesterone on dACC Glu

in female smokers. Glu levels in the dACC were determined using magnetic resonance spectroscopy. A significant sex-by-smoking interaction was detected [$F(1,13)=6.220$, $p=0.027$], suggesting that women may have less dACC Glu than men after overnight abstinence and that acute smoking may decrease dACC Glu in men, but increase it in women. In abstinent women, but not men ($ps>0.05$), lower dACC Glu was associated with greater cigarette craving ($R^2=0.392$, $p=0.034$), negative affect ($R^2=0.289$, $p=0.068$), psychological withdrawal ($R^2=0.571$, $p=0.009$), and anxiety ($R^2=0.306$, $p=0.061$), as well as greater relief of negative affect after smoking ($R^2=0.399$, $p=0.034$). Moreover, lower dACC Glu was associated with greater plasma estradiol concentration ($R^2=0.557$, $p=0.044$), but not progesterone ($p>0.05$). These results provide evidence for sex differences in the neural substrates that underlie negative smoking-related states and their relief by smoking, and for the role of ovarian hormones in the expression of these differences. Of clinical relevance, these data suggest that increasing dACC Glu may be a promising therapeutic target for smoking cessation for women, but not men.

FUNDING: Federal

SYM2B

PREMENOPAUSAL FEMALE DAILY SMOKERS WITH ELEVATED PREMENSTRUAL AFFECTIVE SYMPTOMS REPORT GREATER POSITIVE CIGARETTE EFFECTS

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Background: Premenstrual Dysphoric Disorder is a female-specific depressive disorder characterized by premenstrual increases in affective and physical symptoms severe enough to impair function or cause distress. While studies have found that premenopausal female smokers with greater cyclical changes in premenstrual symptoms are more likely to relapse, more research is needed to understand motivational processes underlying naturalistic smoking behavior in females with elevated premenstrual affective symptoms. Methods: Premenopausal female daily smokers completed 35-days of Ecological Momentary Assessment during which they were told to smoke as usual. Menstrual information and affective premenstrual symptoms were assessed at the end of each day. Females with a 30% relative cyclical increase in at least one affective symptom in the premenstrual (7 to 1 days prior to menstrual onset) compared to postmenstrual (4 to 10 days post menstrual onset) phase were classified as having elevated premenstrual affective symptoms. Following the first cigarette of the day and at random prompts throughout the day, participants reported on positive subjective cigarette effects ('Was the last cigarette pleasurable?', 'Did the last cigarette relieve unwanted feelings or symptoms?') of the last cigarette smoked. Models controlled for time in study, race, prompt type, baseline depressive symptoms, cigarette dependence, and phase. Results: Seventy-three women had affective premenstrual symptoms data from both the premenstrual and postmenstrual phase and 13 (17.8%) were classified as having elevated premenstrual affective symptoms. Females with elevated premenstrual affective symptoms reported greater pleasurable and negative affect relief cigarette effects ($ps<.02$). Conclusions: The results of this study suggest that females with elevated premenstrual affective symptoms may experience greater positive cigarette effects. Further studies are warranted to investigate mechanisms of smoking behavior in females with elevated premenstrual affective symptoms.

FUNDING: Federal

SYM2C

HORMONAL CONTRACEPTIVE USE AND SMOKING-RELATED SYMPTOMS: A PRELIMINARY LINK IN AN UNDERSTUDIED GROUP

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Prior research indicates that smoking-related symptoms (SRS; e.g., craving) vary across the menstrual cycle, perhaps due to ovarian hormones. Greater variability in SRS across the menstrual cycle has been implicated as a risk factor for smoking relapse. However, this research has been limited to naturally-cycling women who do not use hormonal contraceptives (HCs). Approximately half of women of reproductive age who smoke cigarettes also use HCs. Although HCs significantly alter ovarian hormones, little is known about the association between HC use and SRS. The goal of this preliminary study was to prospectively examine differences in SRS by HC use. We enrolled three groups of women: naturally-cycling (NC), oral contraceptive users (OC) and depot medroxyprogesterone acetate users (DMPA). For six weeks, all participants completed daily ecological momentary assessments to measure SRS. Participants also collected weekly dried blood spots to measure progesterone and estradiol. Linear mixed models were used to assess study group differences in changes in SRS across menstrual phases (or equivalent). Participants (n=52) in the OC group (n=18) were significantly younger than



the participants in the DMPA (n=21) and NC (n=13) groups (mean \pm standard deviation [sd]: 24.9 \pm 2.1 vs. 27.6 \pm 4.5, vs. 30.2 \pm 2.8, respectively; $p < .001$). Change in cigarettes/day from early follicular to ovulation varied by study group with the NC group (mean [95% CI]: 3.1 [-5.4, -0.9]) reporting more change than the OC group (-0.1 [-2.1, 1.8]), $p = 0.004$ and, possibly, the DMPA group (-0.4 [-2.3, 1.4]); $p = 0.067$). Similar patterns were observed in premenstrual pain. The OC and DMPA groups had more stable cigarettes/day and premenstrual pain compared to the NC group. While this observation is preliminary, it suggests that SRS may be more stable in women who use HCs. Given that greater SRS variability across the menstrual cycle is linked to increased risk of relapse, our findings suggest that the use of HCs be at reduced risk for smoking relapse. Further research is needed regarding how HC use may influence smoking cessation outcomes.

FUNDING: Academic Institution; Nonprofit grant funding entity

SYM2D

SEX-DIFFERENCES RESEARCH INFORMING INVESTIGATION OF A NOVEL PHARMACOLOGICAL TREATMENT FOR SMOKING IN WOMEN

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Background: Women's health risks from smoking have risen more rapidly and cessation rates may be less successful with many existing cessation aides, compared to men's. A better understanding of sex-sensitive mechanisms contributing to the maintenance of smoking behavior could inform the development of novel treatments, tailored for women smokers. Several lines of evidence support catechol-O-methyltransferase (COMT) enzyme activity as a sex-sensitive factor impacting smoking behavior. For example, individuals with a genetic variant coding for higher COMT enzyme activity have higher smoking risk and there are neurobiologically-plausible mechanisms by which COMT-inhibition could counter nicotine dependence, in a sex-sensitive manner. Methods: Nicotine dependent smokers (N=196) rated withdrawal symptoms, smoking urges and affect, and completed cognitive tasks following biochemically-confirmed overnight abstinence and after an intravenous nicotine administration session. Analyses with mixed-models assessed effects of genotype (COMT Val158Met (rs4680)), sex, genotype-by-sex and genotype-by-sex-by-time-point interactions. Results: In women, the high COMT enzyme activity genetic variant (Val/Val) was associated with more severe withdrawal and smoking urges following overnight abstinence than the low enzyme activity variant (Met/...). These genotype differences were sex-specific (present in women only) and observed during overnight abstinence (dissipated following the nicotine administration session). Conclusions: These sex-sensitive findings may shed light on mechanisms contributing to sex differences in barriers to smoking cessation and suggest that inhibition of COMT enzyme activity may ameliorate abstinence-related aversive symptoms in women. These findings informed the design of our recently-completed R21-funded single-sex study: a double-blind, placebo-controlled study of tolcapone (an FDA-approved medication which inhibits COMT enzyme activity) in women smokers. Taken together, these studies underscore the value of considering sex differences research to identify potential novel sex-sensitive or sex-specific pharmacotherapies for smoking cessation.

FUNDING: Federal

SYM3A

SUBCELLULAR PHARMACOKINETICS OF NICOTINIC DRUGS HELP TO EXPLAIN THE TRAFFICKING OF NICOTINIC RECEPTORS

Henry A. Lester, PhD. CA Institute of Technology.

Smoked or vaped nicotine exists partially in a membrane-permeant neutral form ("free base"), which passes through six plasma membrane membranes within a few sec to travel from the lungs to reach the brain. In a few more sec, nicotine permeates two additional membranes: the plasma membrane (PM) to reach the cytoplasm and then the membrane of organelles such as the endoplasmic reticulum (ER) to reach their lumen. Meanwhile, in < 1 sec and in all compartments, the uncharged form is interconverting with the charged form. The latter interacts with nicotinic receptors (nAChRs) on the plasma membrane, in the ER and in the cis-Golgi, and perhaps in other organelles. In the ER, previous data from several labs indicate that the binding of nicotine to nascent alpha4beta2* nAChRs stabilizes nAChRs in a process called "pharmacological chaperoning". After the stabilized nAChRs exit the ER in greater numbers and traffic through additional organelles of the exocytotic pathway, they reach the PM. This is the upregulation that underlies some initial stages of nicotine addiction. Our recent measurements employ subcellularly localized, genetically encoded fluorescent biosensors for nicotine to measure the levels of nicotine in ER and also the kinetics of entry and exit. The data explain how the persistence of nicotine in the ER blurs the distinction between "acute"

and "chronic" actions of smoking or vaping. We've developed and exploited analogous biosensors for additional nicotinic ligands, including varenicline, cytosine, and dianicline. The data show that these ligands have distinct subcellular pharmacokinetics, which may partially underlie their different effectiveness for smoking cessation. Funding: This work was supported by awards from the National Institutes of Health (DA037161, DA043829), by the California Tobacco-Related Disease Research Program (23XT007, 27IP0057, 27FT002), by NARSAD, and by the Howard Hughes Medical Institute.

FUNDING: Federal; State; Nonprofit grant funding entity

SYM3B

LYNX1 MODULATES FUNCTION OF NACHR SUBTYPES FOUND IN A SMOKING-RELATED NEURONAL CIRCUIT THROUGH MULTIPLE, ISOFORM-SELECTIVE, MECHANISMS

Paul Whiteaker, PhD. Barrow Neurological Institute.

The endogenous neuromodulator lynx1 is highly expressed in interpeduncular nucleus (IPN) GABAergic projection neurons, along with alpha3beta4- and alpha4beta2-nAChR. Activity of these neurons contributes to somatic aspects of nicotine withdrawal. Lynx1 gene deletion also produces hypersensitive nicotine responses in habenular neurons; this region communicates directly with the IPN. We thus investigated mechanisms of lynx1 functional interactions with isoforms (variants containing alternate subunit ratios) of alpha3beta4- and alpha4beta2-nAChR. These isoforms were expressed in *X. laevis* oocytes, using concatenated cDNA constructs, in the presence or absence of lynx1. Agonist responses were recorded using two-electrode voltage clamp and cell-attached single-channel electrophysiology. Cell-surface expression was measured by radioimmunolabeling with [125I]mAb 210 or [125I]mAb 295 (recognizing alpha3 & alpha5, or beta2 subunits, respectively). Mechanisms of lynx1 reductions of alpha3beta4-nAChR function varied across isoforms from primarily by lowered cell-surface expression, to principally by single-channel effects that spanned decreased unitary conductance, reductions in the proportion of long bursts of opening, and lengthened closed dwell-times. For both alpha4beta2-nAChR isoforms, function was predominantly lowered by lynx1 through reduced cell-surface expression. Macroscopic agonist EC50 values were unaffected by lynx1 across all subtypes and isoforms, indicating that all effects were allosteric in nature. No effects on function or cell-surface expression were observed when nAChR isoforms were coexpressed with mutated lynx1 (control). These findings demonstrate a previously-unappreciated degree of selectivity of prototoxin/nAChR interactions across isoforms. Lynx1 is known to shape native nicotinic cholinergic responsiveness. Thus our findings likely have physiological significance: especially in the case of interactions in the MH-IPN tract that has proven relevance to smoking behavior. This work was supported by awards from the National Institutes of Health (R01 DA043567 and R21 DA027070S1), and by funding provided by the Barrow Neurological Foundation.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

SYM3C

THE NICOTINIC RECEPTOR MODULATOR, LYNX2, REGULATES ANXIETY-RELATED BEHAVIORS THROUGH INTERACTIONS WITH NACHR SUBTYPES IN ANXIETY-RELATED CIRCUITRY

Julie M. Miwa, PhD. Lehigh University.

Anxiety in response to stressors is thought to be advantageous but the continuation of anxiety past the stressor without regulation can lead to an affective disorder. Affective disorders are often comorbid with nicotine dependence. Individual differences in biological factors such as genetics and the efficacy of cholinergic signaling can act to modulate responses and predispose some to anxiety disorder development. The adaptive ability to update these associations is dependent on the competency of the underlying neural circuitry, without which the development of an anxiety disorder could result. Specific nicotinic acetylcholine receptor (nAChR) subtypes have been implicated in regulating the network excitability of the amygdala, the brain region widely reported as the mediator of the emotional output of fear and anxiety phenotypes across species. The negative nicotinic receptor modulators, lynx2, demonstrates expression in brain regions relevant to these anxiety-like behaviors such as the amygdala and medial pre-frontal cortex. Mice null for lynx2, lynx2KO mice, display not only heightened basal anxiety-like behavior, but also abnormal updating of behavior in response to new information, for instance, in fear extinction or chronic social defeat stress (CSDS) paradigms. Delivery into specific anxiety circuits through viral replacement of can ameliorate the phenotypes in lynx2KO mice. Our data supports that the inability to update learned fear can be explained by the loss of amygdalar nicotinic receptor-mediated calcium homeostasis critical for maintaining the bidirectionality of synaptic strength. This can be rescued by pharmacological or genetic inhibition of alpha 7 nAChRs, and together with demonstration of a



physical interaction of lynx2 and alpha 7 nAChRs, our data implicate alpha 7 nAChRs in lynx2-based behavioral adaptations. We hypothesize that lynx2 modulation of nAChRs within the amygdala acts to regulate responses to salient behavioral paradigms. This work was supported by NIH R01DA043567 (JMM and KRA), R21DA033831 (JMM), NSF BCS-1745823 (KRA), Det Frie Forskningsråd CU-29979812, and Sigma Xi (KRA).

FUNDING: Federal; State; Academic Institution; Nonprofit grant funding entity

SYM3D

LYNX2 MODULATES NICOTINE SELF-ADMINISTRATION AND RELAPSE-RELATED BEHAVIORS

Christie D. Fowler, PhD. University of California Irvine.

Nicotine's action on nicotinic acetylcholine receptors (nAChRs) in the brain underlie the addictive properties of the drug. Recently, the endogenous protein, lynx2, has been shown to directly interact with nAChRs to modulate cellular function. Given the co-expression of lynx2 and nAChRs in addiction- and learning-related brain regions, we hypothesized that the presence of lynx2 mediates cellular function contributing to nicotine dependence. In these studies, we sought to investigate whether the absence of lynx2 would alter learning/memory behavior, nicotine reinforcement, and relapse-related nicotine seeking behaviors. Learning and memory function were assessed in an operant food training task. Nicotine reinforcement was examined with intravenous nicotine self-administration, a model of drug intake with high translational value to human patterns of drug use. Finally, relapse-related behaviors were assessed with the incubation of craving protocol. Interestingly, we found that mice with knockout of the Lynx2 gene self-administer less nicotine at higher doses, suggesting increased activation of the aversion-related pathway in the brain. Further, while the wildtype mice exhibit an incubation of craving, the lynx2 knockout mice do not, indicating a decrease in nicotine seeking after abstinence. Taken together, these studies provide evidence that lynx2 interacts with nAChRs to modulate nicotine dependence and drug-associated memory, providing a potential novel target for therapeutic development for tobacco/nicotine cessation. Supported by the Tobacco-Related Disease Research Program (T30IP0931) and funds from the University of California Irvine.

FUNDING: Federal; State; Academic Institution; Nonprofit grant funding entity

SYM4E

COMPARING TWO METHODS OF PROACTIVE CARE COORDINATION FOR CANCER SURVIVORS WHO SMOKE

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Significance: Tobacco use among patients with cancer negatively impacts treatment, survival, and quality of life outcomes. Most patients who smoke at diagnosis, however, do not quit. Reaching out to patients to offer tobacco cessation services (proactive engagement) may boost successful quitting. This study evaluated the feasibility and efficacy of two methods of proactively engaging cancer survivors about tobacco treatment. **Methods:** Using cancer registries at three health systems in New York City, we assessed 14,914 patients for eligibility and randomized 581 (recruitment goal 600) to two treatment arms: Mailed Care (292) and Telephone Care (289). Participants in both arms were sent a cover letter, a study FAQ brochure, and a 4-page pamphlet outlining consequences of smoking for cancer survivors and benefits of quitting. Mailed care participants received a Quitline referral form to send back to get a call from the state Quitline for cessation treatment, including nicotine replacement therapy (NRT). Telephone care participants were contacted by a study counselor every 3 months for 12 months (4 total calls) to increase motivation to engage in treatment and provide a warm handoff to the state Quitline. The primary outcome was percentage of patients who received care from the Quitline and secondary outcomes were self-reported 7-day and prolonged 6-month smoking abstinence at 12 month. **Results:** More participants in the Telephone Care arm were referred to the Quitline than the Mailed Care arm (12.1% 35/289 vs. 1.4% 4/292; OR=9.9; 95% CI:3.9,33.5) and completed a call with the Quitline (4.5% 13/289 vs. 1% 3/292; OR=4.5; 95% CI:1.4,19.9). The proportion of participants in each arm that received NRT from the Quitline did not significantly differ (2.8% 8/289 vs 1% 3/292; OR=2.7; 95% CI: 0.8,12.6). Among participants who completed 12-month follow-up, 7-day abstinence from cigarettes was 39% (21/54) in Mailed Care and 33% (15/45) in Telephone Care; 6-month prolonged abstinence was 27% (13/49) in Mailed Care and 20% (8/40) in Telephone Care. **Conclusions:** Proactive intervention delivered through Telephone care was more effective at increasing referrals to and completed calls with the Quitline, but rates of treatment engagement were low in both group. Telephone

care was not more effective in increasing NRT use or abstinence rates compared with Mailed Care. More participants quit than interacted with the Quitline, suggesting that mailing information about cessation to cancer survivors could be a useful, low burden strategy for increasing quit rates.

FUNDING: Federal

SYM4A

EFFECTS OF MOTIVATION PHASE INTERVENTION COMPONENTS ON QUIT ATTEMPTS AND ABSTINENCE IN SMOKERS UNWILLING TO QUIT: A FACTORIAL EXPERIMENT

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Significance: At any given healthcare visit, most smokers are unwilling to make an aided quit attempt. This study attempted to identify Motivation phase intervention components that yield especially promising effects on quit attempts and abstinence when used among primary care patients who were initially unwilling to quit. **Methods:** A 4-factor randomized factorial experiment was conducted amongst primary care patients (N=577; 60% women, 80% White) presenting for regular healthcare visits who were willing to reduce their smoking but not quit. The intervention components tested were: 1) Nicotine Mini-Lozenge vs. No Mini-Lozenge, 2) Smoking Reduction Counseling vs. No Reduction Counseling, 3) Motivational 5Rs counseling (Relevance of quitting, Risks of smoking, Rewards of quitting, Roadblocks, and Repetition) vs. No Motivational 5Rs, and 4) Behavioral Activation counseling (BA) vs. No BA. Interventions were administered over a 1-year period, and participants could elect to receive the study cessation treatment at any point during their participation. Making a quit attempt of at least 24 hours and self-reported 7-day point-prevalence abstinence were assessed at 26 and 52 weeks post-enrollment. **Results:** No treatment main effects were found on abstinence, but there was a significant three-way interaction at 52 weeks (Mini-Lozenge X Reduction Counseling X BA; p=0.03). Participants receiving the Mini-Lozenge alone attained the highest abstinence rate (17%), whereas those receiving both the Mini-Lozenge + Reduction Counseling reported the lowest abstinence rate (4%). Reduction Counseling exerted a significant main effect (p=0.01) on quit attempts occurring by 52 weeks; those receiving Reduction Counseling were less likely to make a serious quit attempt (40% than those who did not (51%). **Conclusions:** These findings support the promise of long-term use of Mini-Lozenge for spurring abstinence in smokers initially unwilling to quit. However, Reduction Counseling undermined the beneficial effects of Mini-Lozenge and decreased the likelihood of making a serious quit attempt, casting doubt on its effectiveness during the Motivation phase of smoking treatment.

FUNDING: Federal

SYM4B

STRIKE AGAIN WHILE THE IRON IS HOT: A SMART (SEQUENTIAL, MULTIPLE ASSIGNMENT, RANDOMIZED TRIAL) OF CHRONIC CARE INTERVENTION FOR SMOKING

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Significance: The majority of smokers who try to quit relapse. Smoking is not, however, typically treated using a chronic care model, and it is unclear how best to intervene with smokers post-relapse to increase their likelihood of making a new aided quit attempt. **Methods:** Participants were primary care patients who, when asked at a regular clinic visit, said they would like to quit smoking. They received an initial cessation treatment (3 counseling sessions, 8 weeks of nicotine patch), and encouragement to enter relapse recovery [RR] treatment if they relapsed. Staff assessed whether participants smoked each of the past 7 days (relapsed) at every contact for 6 months. Participants reporting a relapse were randomized to one of three RR treatments: 1) up to 11 months of smoking reduction counseling and nicotine mini lozenges with periodic offers of cessation treatment after the first month of reduction, 2) up to 11 months of recycling (periodic offers of cessation treatment starting immediately post-relapse), or 3) quitline referral. Only relapsers in reduction or recycling were eligible to make a new study-aided quit attempt. **Results:** Of those in initial cessation treatment (N=1154), 21% reported 7-day point-prevalence abstinence at Week 26. By contrast, 63% (725/1154) reported relapsing, and 80% (582/725) of these relapsers agreed to engage in chronic care



treatment and were randomized to RR treatment. Engagement rates (attending at least one RR session) among those randomized were: 80% (175/220) for reduction and 85% (184/217) for recycling; 100% (145/145) remained on a phone call and were encouraged to call the quitline for more treatment. Less than half (46%; 101/220) of relapsers in reduction versus 74% (160/217) of relapsers in recycling decided to make a new aided quit attempt and engaged in cessation counseling. Conclusions: Most relapsers agreed to engage in chronic care treatment. Encouragement to make a new quit attempt as soon as possible following relapse increased participants' likelihood of making a new aided quit attempt, compared to switching the treatment focus to reduction for 1 month before encouraging re-engagement in cessation treatment.

FUNDING: Federal

SYM4C

PLUTO TRIAL: THE IMPACT OF INITIAL RESPONSE TO TREATMENT ON THE DELIVERY OF A LONGITUDINAL CARE MODEL OF SMOKING CESSATION

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The Program for Lung Cancer Screening and Tobacco Cessation (PLUTO) trial aims to answer three questions about how to implement a longitudinal care model of smoking cessation: (1) if it is helpful to provide prescription medications for individuals who fail to quit with coaching and NRT, (2) if individuals who quit within 8 weeks require additional treatment for one year or whether treatment intensity can be reduced, and (3) if it is better to identify a smoker as responding or not responding to treatment earlier or later. The high rate of relapse following initial treatment defines these questions as important knowledge gaps. PLUTO employs a sequential, multiple assignment, randomized trial (SMART) design. All participants, current smokers at high risk for lung cancer and meeting other inclusion/exclusion criteria, are provided tobacco longitudinal care (TLC) which includes a combination of intensive telephone coaching (relapse-sensitive call protocol) and NRT for one year, with a minimum of monthly contact. All individuals are randomized to the duration of the initial phase of TLC treatment: 4 vs. 8 weeks. At the end of initial treatment, participants are assessed for complete response vs. incomplete response to consider the second phase of treatment. Incomplete responders (i.e., any smoking, even a puff, in the last 7 days) are randomized to continue TLC or TLC plus an expanded toolbox of treatment options, adding the prescription drug options bupropion and varenicline. At the end of initial phase of TLC treatment, complete responders are randomized to continue TLC or TLC with quarterly rather than monthly contact. All participants receive longitudinal treatment for one year, however the treatment components, treatment intensity, and timing of treatment availability vary. We will report on the proportion of complete and incomplete responders to initial treatment, how this data point impacts the SMART study design and sample size requirements, and engagement in the longitudinal care model in this older population of smokers. The goal is to develop an effective adaptive intervention protocol that acknowledges the probability of slips and relapse.

FUNDING: Federal

SYM4D

ENGAGING PERSISTENT SMOKERS SIX MONTHS POST-HOSPITAL DISCHARGE WITH EITHER TELEPHONE-BASED CARE COORDINATION OR STANDARD TELEPHONE-BASED SMOKING CESSATION COUNSELING

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Significance: Most smokers that try to quit after hospitalization will relapse. These smokers might benefit from re-engagement in smoking cessation counseling. This re-engagement might be enhanced if cessation counselors worked with providers to improve utilization of pharmacotherapy and enhance smoking cessation. Methods: Hospitalized smokers referred from primarily rural hospitals were randomized to receive cessation counseling only (C) consisting of telephone counseling provided during the hospitalization and post-discharge or similar counseling combined with care coordination (CCC) including feedback to the smoker's healthcare team and help for the smoker in obtaining pharmacotherapy. At 6 months post-hospitalization, persistent smokers were re-engaged with up to 4 counseling calls of CCC or C. This report focuses on the results of that re-engagement. Results: Of 337 smokers identified as relapsed or persistent smokers 6 months post-discharge, 223 (66.2%) engaged in additional telephone-based counseling, completing an average of 1.88 (SD 1.61) counseling calls; 40.1% (n=135)

used cessation pharmacotherapy between 6-12 months post-discharge. There was no difference in the uptake of either counseling or overall pharmacotherapy use across the two treatment arms. Use of prescription pharmacotherapy, however, was higher in recipients of CCC than C (25.4% versus 15.5%; $p = 0.02$). At month 12, 14.2% of CCC participants and 10.7% of C participants reported that they were abstinent ($p = 0.33$). Conclusion: Re-engagement of smokers 6 months post-discharge can lead to new quitters, at which time care coordination might facilitate use of prescription medications.

FUNDING: Federal

SYM5A

JUUL AND E-CIGARETTE AWARENESS AND RELATED EXPERIENCES AMONG PARENTS AND SCHOOL PERSONNEL

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Introduction: Schools are key environments for JUUL and e-cigarette interventions. Parents are also key stakeholders for e-cigarette policy development and implementation. Little is known about 1) teachers/administrators' and 2) parents' JUUL-related awareness and experience with student e-cigarette use. Data on parents' support for e-cigarette-related policies is also limited. Methods: Data were from two separate surveys fielded October-November 2018. Survey 1 was conducted among a national sample of 1,525 middle/high school teachers/administrators. Survey 2 was conducted among a nationally representative sample of 2,885 parents of middle/high school students. Univariate and bivariate analyses examined awareness, concern, and support for policies. Parent data were weighted. Results: Among teachers/administrators, 68% had seen or heard of JUUL and 47% correctly identified an image of JUUL as a vaping device. Only 56% of parents had seen or heard of JUUL and only 44% accurately identified a JUUL image as a vaping device. Only 36% of teachers/administrators were concerned about adolescent e-cigarette use. In contrast, parents' concern about adolescent e-cigarette use was high (60.6%), however, concern about their own child's use was low (33%). High school staff had lower rates (34%) of seeing student JUUL use versus middle school staff (53%). The most common locations for JUUL use reported among high school staff were the bathroom (48%), behind/ beside the building (40%), and in the parking lot (39%). Most school staff reported having an e-cigarette policy (83%) but only 43% reported a policy specifically including JUUL. Most parents supported policies restricting e-cigarette marketing to youth (94%) and bans on flavored e-cigarette sales (75%). Conclusions: Data from these surveys suggest notable gaps in JUUL awareness among school staff and parents. While school staff had greater JUUL awareness and policies in place to address e-cigarette use, parents expressed greater concern about adolescent use. Parents and teachers should be mobilized to garner support for school and population-level e-cigarette policies to address rising youth e-cigarette use.

FUNDING: Other

SYM5B

RAPID ASSESSMENT OF SCHOOL STAFF'S KNOWLEDGE OF HIGH SCHOOL STUDENTS' E-CIGARETTE USE AND SCHOOL POLICY — NORTH CAROLINA, 2019

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Significance: E-cigarette use increased considerably among U.S. youth during 2017-2018, and many youth report using e-cigarettes on schools grounds, including in classrooms and bathrooms. We assessed school staff's knowledge of student e-cigarette use and school policies to inform public health action in North Carolina. Methods: In May 2019, staff from a random sample of 25 out of 451 public and charter high schools in North Carolina were invited to complete an online survey and a 30-minute semi-structured interview; twelve schools consented to =1 assessment component. We assessed staff's knowledge of students' e-cigarette use and school policies, including school measures to prevent and reduce e-cigarette use. Investigators collected e-cigarette products confiscated from students during the 2018-19 academic year and determined e-cigarette retailer density in =5-miles of schools. Results: Among 607 staff that completed the survey, 28% observed students use e-cigarettes in the past year, and 84% believed students' e-cigarette use is somewhat or very problematic and contributes to learning disruptions. Approximately 85% of respondents know their school's policy prohibits possession, use, and sale of e-cigarettes on school grounds. Nearly 55% were not confident their school has resources to help students quit using e-cigarettes. From 35 interviews, emerging themes included concern that the school's tobacco-free policy does



not deter students from using e-cigarettes, and that additional resources and education are needed (e.g., peer to peer education). We collected 263 products from 9 schools, including 144 e-cigarettes and 81 pods. A total of 89 e-cigarette retailers were identified =5 miles of participating schools. Conclusion: School staff believe e-cigarette use is a problem among students and school policies are not a deterrent. Targeted approaches are critical to prevent e-cigarette use in schools, including evidence-based prevention curricula and alternatives to out-of-school suspension programs to educate staff, parents, and youth on e-cigarette harms, increase compliance with the tobacco-free schools' law, and help youth quit e-cigarettes.

FUNDING: Federal

SYM5C

RAPID ASSESSMENT OF SCHOOL STAFF'S KNOWLEDGE AND AWARENESS OF STUDENTS' E-CIGARETTE USE AND SCHOOL POLICY – CALIFORNIA, 2019

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Significance: During 2017–2018, e-cigarette use among US high school students increased by 78%, coinciding with rising sales of JUUL. E-cigarette use by students on school grounds is a rapidly emerging public health threat. A rapid assessment was conducted to further understand school staff's awareness and knowledge of e-cigarette use and practices in policy implementation and disciplines. **Methods:** School staff (n=1927) from a convenience sample of 36 public high schools across California (62% response rate) participated in an online survey, which was open for five weeks. Using a visual cue, participants were asked if they had seen e-cigarette devices at their school and their perception of the problem. Knowledge was assessed by asking participants about the harm and contents of e-cigarettes. Lastly, participants were asked about awareness of a school policy addressing e-cigarette use and the best method for education on e-cigarettes. Descriptive analysis were conducted by region, urban-rural location, gender, and staff position. **Results:** Only (44%) of school staff reported seeing any e-cigarette device on school grounds over the previous 12 months. About half of participants thought student e-cigarette use on school grounds was increasing and one-third were not sure how the problem was changing. Most school staff believed e-cigarettes can carry nicotine (89%), and marijuana or cannabis oil (84%). Although most (73%) staff believed e-cigarettes are very harmful, 7% were unsure of the harm. When comparing the staff's knowledge of the school's e-cigarette policy to their administration's, a majority (90%) were aware that it prohibits possession, use, and selling of e-cigarettes. Staff reported wanting more information through e-mail/letter (69%), personal development training (40%), educational videos (29%), online interactive tutorials (23%), and educational assembly (21%). **Conclusion:** Half of school staff surveyed believe that students' use of e-cigarettes on school grounds is increasing. Further education of school staff, through preferred modalities, is important to reduce student e-cigarette use in this environment.

FUNDING: Federal

SYM5D

USING GARBOLGY MAPPING TO UNDERSTAND HOW THE MICRO CULTURES OF HIGH SCHOOLS ARE BEING ALTERED BY JUULING — SAN FRANCISCO BAY AREA, 2019-2020

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Significance: CDC and FDA conducted surveys that showed e-cigarette use among US youth had risen rapidly to epidemic levels. From California's biannual surveys, we learned after the fact that the epidemic had already taken hold. Little was known about youth use of JUUL/JUUL-compatible products, but we had already heard that "juuling" was creating substantial challenges for students, parents, teachers, administrators, community members, and health workers. Students reported that juuling had not only become a substance use issue, but also that juuling was dramatically altering the culture of their schools. **Methods:** To examine cultural facets of e-cigarette use, our community-based participatory research team developed a novel strategy – garbology mapping – to examine juuling. We purposively sampled 12 public high schools, stratified by the percentages of students from low-income families. At student parking lots and perimeter areas, we systematically collected all forms of tobacco and cannabis waste on one day between July 2018–April 2019. We photographed each item and used digital

image metadata to visualize micro cultural patterns. **Results:** At 10 schools, we found at least one JUUL/JUUL-compatible item. Our analysis showed varying patterns of use. At schools with large proportions of affluent and upper income white students, we found zones of JUUL/JUUL-compatible waste without evidence of other tobacco or cannabis use. At some of these affluent schools, we also found zones of JUUL/JUUL-compatible waste mixed with recently discarded cigarette waste. At schools serving predominantly low-income Latino and African American families, we found zones with a wide range of cigarette, cigarillo and cannabis waste, in some cases mixed with a few JUUL/JUUL-compatible items. **Conclusion:** At Bay Area high schools, students are creating different micro cultural patterns of juuling. These patterns appear to be a function, at least in part, of the social class and ethnicity of the student cliques. Garbology mapping provides a rapid view into students' micro cultural patterns of use, thereby illuminating potential opportunities to prevent and reduce use on school grounds.

FUNDING: Federal

SYM5E

CHEMICAL ANALYSIS OF VAPING PRODUCTS CONFISCATED BY CALIFORNIA SCHOOL ADMINISTRATORS – FINDINGS AND IMPLICATIONS

Ping Wang, PhD, Flavia Wong, Wenhao Chen, Kazukiyo Kumagai. California Department of Public Health.

Background: Use of nicotine, marijuana, and other substances through volatilization of their liquid forms into an aerosol is rapidly increasing among youth and young adults. This emerging practice, generally called "vaping," uses an electronic device to heat the liquids. So far, little is known about the health risks of vaping, especially for child and adolescent users. It is vital to understand exposures to potentially harmful chemicals to better assess the health impact of vaping. **Methods:** Various vaping products including VapePen cartridges, e-cigarette cartridges, Juuls, Juul-compatible pods, and e-liquids were confiscated at several public high schools in California. Liquids in these devices were extracted with isopropanol and analyzed by Gas Chromatography Mass Spectrometry (GC/MS) to measure the amount of nicotine, propylene glycol (PG) and glycerol (GL): three major components of e-liquids. For comparison, new Juul pods with different flavorings and nicotine content were purchased and analyzed using the same method. Additional volatile organic chemicals also were screened. **Results:** For e-cigarette cartridges, Juul/Juul-compatible pods, and e-liquids, nicotine content ranged between 0-73.3 mg/ml, corresponding to about 0-7%, and PG and GL were between 0-800.9 and 0-1064.1 mg/ml, respectively. For VapePen cartridges, cannabinoids such as cannabidiol (CBD) and tetrahydrocannabinol (THC) were identified in most of the samples; however, PG and GL were seldom detected. Various terpenes, flavorings, and some acids were detectable in all samples and both nicotine and cannabinoids were present in some samples. **Conclusions:** Nicotine concentration was as high as 73 mg/ml in the confiscated vaping products. Some liquids contained both cannabinoids and nicotine, which indicates that some high-school students are dual users. Vapers might also refill their Juul pods with other e-liquids. Manufacturer labels may sometimes be misleading. Because PG and GL were seldom detected in some products, they are not the only carriers used in vaping devices. Various flavorings and terpenes also were present. The health risks of heating these compounds needs further investigation.

FUNDING: State

SYM6A

SCREENING FOR REMOTE CLINICAL TRIALS: METHODS TO ENHANCE PARTICIPANT DIVERSITY

Matthew J. Carpenter, PhD, Amy E. Wahlquist, John T. Clark, Jennifer Dahne. Medical University of South Carolina.

Though remote clinical trials offer the potential to efficiently screen and enroll large numbers of study participants, such trials are threatened by biased sampling, which would decrease generalizability. Fortunately, remote screening procedures can also help enhance participant diversity. Within the context of an ongoing, nationwide clinical trial (eventual N=660, current N=231), in which we have screened 4,159 potential participants in 13 months (~74 per week), this presentation will describe two automated methods for remote screening. The first is focused on strategies to maintain proportionate recruitment of key demographic groups. Methods ensure recruitment of <60% of any one sex and <70% of any one race, within each recruitment location. The methods allow the research team to specify an enrollment minimum for each demographic characteristic of interest, and will turn away potential enrollees if a demographic quota is full. For example, of the 231 participants now enrolled in our trial thus far, 134 are female (58%) and 37% are non-White. Future iterations of this automated process can be tailored so that investi-



gators choose which demographics or clinical characteristics (e.g., menthol users, early e-cigarette experimenters) they wish to target. The second automated procedure aims to minimize potential 'gamers,' i.e., people who repeatedly complete screening questions, altering responses until successfully navigating eligibility criteria to gain study entry. A study-generated dashboard queries all screeners and identifies duplicate entries based on discrete fields, which are flagged and appropriately disqualified from study entry. Within our 13-month enrollment period to date, 170 potential participants (4% of total submitted screenings) have been identified as duplicates and have been appropriately disqualified. Though small in number, these 'gamers' could have falsely gained entry into the study. Collectively, these methodological innovations allow for efficient, yet still effective and representative screenings into clinical trials, which offer future promise for treatment researchers.

FUNDING: Federal

SYM6B

REMOTE INFORMED CONSENT OPTIONS AND EVALUATION

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The informed consent process is indispensable in human subjects research. Studies with remote sites often impose significant travel costs and time commitments on both participants and research teams. Often this involves travel to a study site solely for obtaining informed consent. Alternatively, in multi-site studies, consent procedures often require faxing or mailing documents to the coordinating site. However, this requires remote sites to be engaged in research with locally trained and approved study team members obtaining consent. Remote sites often do not have this research capacity built into their workflow. With the advent of electronic media and ubiquitous online access, electronic consent (e-consent) technologies present several viable alternatives. Recently asynchronous e-consent, where potential participants are provided a link to an online e-consent form, has become acceptable for certain low risk research. Participants can review the consent on their own, and then digitally sign. Contact information is provided for questions about the research. However, this modality is often deemed unacceptable for higher risk research where a full informed consent process is required. No matter the risk level, the asynchronous mode does not promote participants' full engagement with the research team. A novel method developed at MUSC uses a hybrid telehealth/e-consent (teleconsent) approach, allowing remote communication for a full informed consent process along with the benefits of an interactive synchronous e-consent platform. Herein we will discuss these different approaches to e-consent and present early results of a non-inferiority study to examine the impact of teleconsent on comprehension and research engagement. This study was done in the context of a larger nationwide clinical trial on e-cigarettes. Our study included 294 participants, 122 of whom were consented with teleconsent and the rest with a combination of phone with paper and/or e-consent. Preliminary results show a slight but significant advantage in comprehension in the teleconsent group as measured by a consent comprehension instrument, even when participants were matched on several covariates.

FUNDING: Federal

SYM6C

REMOTE ASSESSMENT OF SUBSTANCE USE: ENHANCING SELF-REPORT VIA MOBILE DEVICES

Rachel L. Tomko, Ph.D., Kevin M. Gray, Lindsay M. Squeglia, Erin A. McClure. Medical University of South Carolina.

A challenge in remote clinical trials is the need to adapt in-clinic assessments for remote data collection, while maintaining data quality. Mobile phones not only allow for remote collection of self-report on the quantity and frequency of substance use, but can also increase accuracy when administered frequently, minimizing retrospection. In this presentation, we first examine the convergent validity of number of cigarettes per day (CPD) recorded for a two-week period among 21 non-treatment-seeking smokers. CPD was measured via daily mobile surveys and an in-person Timeline Follow-back (TLFB). We present correlations between each measure and other assessments expected to be strongly associated with smoking quantity. Average CPD assessed via daily reports were more strongly associated with average expired carbon monoxide ($r=0.69$ vs. 0.62 for TLFB) and self-reported nicotine dependence ($r=0.54$ vs. 0.50 for TLFB) than TLFB-assessed CPD, despite TLFB accounting for 100% of days during the study and daily reports only accounting for 85% of days due to missed reports. We illustrate how small increases in measurement error can have a significant impact on statistical power in clinical trials. Second, we present treatment-seeking adult smokers' ($N=109$) adherence rates with daily self-reported tobacco and substance use assessments sent via text

message and email during an in-person, 8-week pharmacotherapy trial for tobacco use disorder. Text message and emails containing a survey link were sent to participants at the same time each day via REDCap and Twilio, a widely available data management platform and third-party text message service, respectively. On average, participants completed 76% of expected reports within 24 hours (Median=89%). We discuss factors associated with non-adherence. Third, we provide practical considerations for implementing daily assessments in a remote clinical trial, including using REDCap as a data collection platform, costs when implemented in large trials, strategies for encouraging adherence and dealing with missing data, verifying accuracy of self-report, and the potential for assessment reactivity effects.

FUNDING: Federal

SYM6D

DEVELOPMENT AND EVALUATION OF A LOW COST, REMOTE METHOD TO BIOCHEMICALLY VERIFY SMOKING STATUS

Jennifer Dahne, Ph.D., Rachel Tomko, Erin McClure, Matthew J. Carpenter. Medical University of South Carolina.

Remote cessation trials face one key methodological limitation: the need for biochemical verification of smoking status to accurately assess efficacy. Remote collection of expired-air carbon monoxide (CO) is a non-invasive approach that can be used to verify smoking. Smartphone-enabled CO monitors, which are available at considerably lower cost than stand-alone gold standard monitors, could expand the methodologic potential to capture CO remotely. Yet, several issues remain unresolved. Most critically, CO collection via smartphone-enabled monitor must be: 1) integrated in real-time with other research outcomes, 2) valid, and 3) feasible. Accordingly, the purpose of this study is to 1) develop a remote CO data capture system through which a smartphone-enabled CO monitor, the iCO™, is integrated with REDCap and 2) examine validity of and compliance with this system. Development of the iCO™/REDCap system was recently completed and we will demo the system herein. The iCO™/REDCap system initializes the iCO™ via a phone's mobile browser, instructs a participant regarding how to provide a breath sample, and captures a photo of the participant providing a sample to verify identity. All data are stored within REDCap, synchronized with other assessments. Remote validity and compliance testing are ongoing. Smokers ($N=50$), are mailed a kit containing: 1) an iCO™, 2) a gold-standard CO monitor, and 3) saliva collection tubes. Upon receipt, participants complete a baseline session via video and provide a CO sample via each monitor as well as a saliva sample for validity testing. The gold-standard monitor and saliva sample are mailed to study staff and saliva is assayed for cotinine. To examine compliance as pertinent to a variety of trial designs, participants are subsequently randomized to receive prompts to provide CO either once per week or once per day for a period of four weeks. All validity and compliance results will be available for conference proceedings. In sum, this methods development trial has the potential to improve both the feasibility and rigor of remote trials, which will ultimately result in more efficacious and more disseminable cessation interventions.

FUNDING: Federal

SYM7A

CROSS-SECTIONAL AND LONGITUDINAL EVALUATIONS OF COMPREHENSIVE VS. PARTIAL SMOKE-FREE LAWS: FINDINGS FROM THE ITC PROJECT ACROSS 28 COUNTRIES

Geoffrey T. Fong, PhD. University of Waterloo.

Background: The WHO Framework Convention on Tobacco Control (WHO FCTC) calls upon 180 countries to implement comprehensive smoke-free laws in public places and workplaces. But despite this obligation, only 22% of the world's population is covered by a comprehensive law. Methods: Since 2002, the International Tobacco Control (ITC) Project has conducted longitudinal cohort studies to evaluate WHO FCTC policies – including smoke-free policies – in 29 countries. This paper presents data from 50 survey waves over 28 ITC countries—17 high-income countries (HICs) and 11 low-/middle-income countries (LMICs)—to assess differences between countries with complete smoking bans in public places vs. those with partial bans on key impact measures (smoking prevalence in restaurants, bars, workplaces; and home smoking bans). Longitudinal analyses assessed the impact of complete bans vs. partial bans before and after implementation. Results: Countries with comprehensive smoke-free laws had substantially lower levels of smoking in public places. Among HICs (except for Greece), smoking in restaurants was lower in countries with complete bans (1%-10%, Mdn 4%) than partial bans (4%-60%, Mdn 7%); among LMICs, the impact of complete bans was even greater (3%-12%, Mdn 5% for complete bans vs. 7%-95%, Mdn 38% for partial/no bans). A similar pattern was found for bars and workplaces, although the impact of



complete bans was not as strong in LMICs. There were generally no differences in the prevalence of home smoking bans between countries with complete vs. partial laws. The longitudinal pre-post analyses also demonstrated the superiority of complete bans: countries/places that implemented complete bans (i.e., Ireland, France, Mexico City, Mauritius) experienced much greater reduction—and sometimes near-total elimination—of smoking in restaurants and bars compared to those that implemented partial laws (i.e., China, Germany). In some countries, home smoking bans also increased after implementation of smoke-free laws. Conclusions: The findings support the need to strengthen and accelerate implementation of WHO FCTC Article 8, whose guidelines call for comprehensive smoke-free laws.

FUNDING: Federal; State; Pharmaceutical Industry; Nonprofit grant funding entity

SYM7B

CHANGE IS IN THE AIR: TRENDS IN STATE AND LOCAL COMPREHENSIVE SMOKE-FREE LAWS IN THE UNITED STATES, 2000-2018

Brian King, PhD, MPH. CDC Office on Smoking and Health.

Significance: The Surgeon General has concluded that eliminating smoking in indoor spaces fully protects nonsmokers from secondhand smoke exposure. Comprehensive smoke-free laws substantially reduce secondhand smoke exposure, promote smoking cessation, prevent youth initiation, and reinforce smoke-free norms. This study assessed trends in state and local comprehensive smoke-free laws in the U.S. during 2000-2018. Methods: Data on statewide laws came from CDC's State Tobacco Activities Tracking and Evaluation System database. Data on local laws and population coverage estimates came from the American Nonsmokers' Rights Foundation Tobacco Control Laws Database. Comprehensive smoke-free laws were defined as prohibiting smoking in all indoor areas of three venues: private-sector worksites; restaurants; bars. The number of states with comprehensive smoke-free laws during 2000-2018 was assessed. The percentage of the U.S. and state populations covered by a comprehensive law was assessed in 2018 using U.S. Census data. Results: The number of states with comprehensive smoke-free laws increased from zero in 2000 to 27 states and D.C. in 2018. Delaware was the first state to adopt a comprehensive statewide law (2002), and California was the most recent (2016). By December 2018, 59.0% of the U.S. population was covered by a state or local comprehensive law. Among the 23 states that lacked a comprehensive law in 2018, 5 prohibited smoking in two of three venues; 5 prohibited smoking in one venue; 7 allowed smoking in ventilated or designated areas; and 6 lacked any statewide restriction. Nine of the 23 states without comprehensive statewide laws lacked any local laws in 2018. Among the 14 states with local laws, West Virginia had the greatest population coverage (65.1%); between 0.3% (Wyoming) and 44.8% (Texas) were covered in the other states. Conclusion: Considerable progress has been made in adopting comprehensive smoke-free laws during the past two decades. However, two-fifths of the U.S. population remains unprotected by a comprehensive smoke-free law. Continued efforts to promote comprehensive smoke-free laws are critical to protect nonsmokers from this health risk.

FUNDING: Federal

SYM7C

MEASURING COMPLIANCE WITH SMOKE-FREE LAWS, USING MOBILE TECHNOLOGY

Kerstin Schotte, MD. World Health Organization.

Background Adoption of smoke-free policies is only the first step in achieving the desired outcome, which is protection from exposure to tobacco smoke. Enforcement of these policies is key to implementation and monitoring of compliance is essential to our understanding of the status of their implementation. Methods To strengthen the World Health Organization's (WHO) ability to report accurate, quality, reliable and comparable data on compliance with adopted tobacco control legislation, WHO conducted a pilot survey project in seven countries to test three different approaches to collect data for monitoring compliance with tobacco demand reduction policies. (1) Conventional survey. Trained data collectors make observations in sampled smoke-free venues. (2) Expanded experts' survey. 40-60 public health experts and health professionals per country, selected by their geographical distribution across the pilot countries, complete a standard survey, and (3) Crowdsourcing data. Data gathered from the general public through reports of compliance and non-compliance using a mobile application. Data from the expanded experts' survey and crowdsourcing survey were compared with the data collected through the conventional survey. Results Compliance rates reported for the conventional survey were significantly higher than those reported for the crowdsourcing survey. The compliance rates varied by 16%, on average. The variation in rates arose

primarily due to negativity bias—or the tendency to place greater emphasis on violation of the law than to adherence among crowdsourcers. Conclusion The strongest survey method with which to move forward for the purposes of WHO's monitoring of compliance with smoke-free laws is the expanded experts' survey. While the currently methodology has its limitations, having input from 60 experts as compared to 5 experts yields a more credible data set. In order to strengthen the accuracy of the non-compliance rates reported by the group of expanded experts, as compared to the conventional data, the methodology requires further refining.

FUNDING: Nonprofit grant funding entity

SYM7D

NOW SERVING CLEAN AIR IN NEW ORLEANS, AND OTHER LOCAL MUNICIPALITIES IN LOUISIANA

Tonia Moore, MA, MSHCM. Louisiana Public Health Institute.

Significance: Southern states are among the last to adopt statewide comprehensive clean indoor air laws. The Louisiana Clean Indoor Air Act (2007) prohibited smoking in public places, including restaurants, but did not include bars and gaming. It also provided for other loopholes such as allowing smoking in convention centers during tobacco expositions and Mardi Gras balls. The city of New Orleans had over 500 bars, two casinos, and several private clubs – known as Mardi Gras krewes. This study shares strategies and insights used to close these loopholes. Methods: Tobacco control advocates and coalitions in New Orleans started laying the groundwork to strengthen clean indoor air laws in early 2007. Coalition efforts were placed on education, outreach, and advocacy. Tobacco control professionals conducted local studies and research. Media campaigns aimed to educate the public and hospitality workers on the dangers of secondhand smoke exposure in bars and casinos. Local champions like musicians, bar owners, cancer survivors, physicians, businesses and partnerships were instrumental in advancing New Orleans' progress. Strong leadership and the coordination of (a) the roles of key players, (b) the strategic approach taken to secure a comprehensive smoke-free ordinance, (c) the nature of opposition to the law, and (d) the range of tactics and interventions pursued by proponents of the law, were also key factors in the campaign. Results: On January 22, 2015, the New Orleans City Council unanimously passed a comprehensive smoke-free ordinance to eliminate smoking in all indoor workplaces, including bars and casinos. The measure went into effect 90 days later - April 22, 2015. Post-implementation, the indoor air quality in both bars and casinos significantly improved, the City Health Department issued minimal enforcement infractions, and the ordinance remains intact. Four years post-implementation, the casino revenue indicated that there were no long-term impact of the casino going smoke-free. Since New Orleans' success, there have been 18 additional municipalities in Louisiana that have passed comprehensive smoke-free policies.

FUNDING: State; Nonprofit grant funding entity

SYM8A

ASSOCIATIONS BETWEEN VAPING AND SMOKING NICOTINE AND CANNABIS AMONG YOUTH IN CANADA, ENGLAND AND THE UNITED STATES

Fathima Fataar, MSc. University of Waterloo, Canada.

Significance: Vaping has become an increasingly common mode of administration for both nicotine and cannabis, with overlap among users, vaping devices, as well as nicotine and cannabis companies. There is a need to understand patterns of use among youth, including the way nicotine and cannabis are administered. Methods: Data are from Wave 2 of the ITC Youth Tobacco and Vaping survey, an online survey conducted in 2018 among 16-19 year olds recruited from commercial panels in Canada (n=3757), England (n=3819), and the US (n=3961). The prevalence of past 30-day use of vaping nicotine, non-nicotine and cannabis substances, as well as cannabis modes of use was examined. Logistic regression models examined between country differences in prevalence. Results: Past 30-day cannabis use was highest among Canadian youth (16.6%), followed by youth in the US (13.8%) and England (9.0%). Smoking was an equally prevalent mode of administration for cannabis and nicotine among youth in Canada (7.3% and 7.8%) and US (7.3% and 7.0%), whereas smoking cannabis was much less prevalent than smoking nicotine in England (2.9% and 11.0%). Vaping e-cigarettes was substantially more prevalent than vaping cannabis in all three countries. All forms of cannabis use were higher among Canadian and US youth compared to England (p<.001 for all). Past 30-day cannabis users in the US were more likely to report vaping cannabis oil (30.1%), and extracts such as wax and shatter (30.2%) compared to cannabis users in Canada (18.6% and 22.9%) and England (14.3% and 11.0%). Additional findings on potential misclassification of e-cigarette vs. cannabis vapers will



also be presented. Discussion: Youth are administering cannabis and nicotine using a wide diversity of modes. Cannabis users in the US—in which an increasing number of states have legalized medical and non-medical cannabis—reported notably higher adoption of higher strength cannabis products, including cannabis oils and extracts.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity; Other

SYM8B

THE EVOLVING CANNABIS PRODUCT MARKET AND DIFFERENCES BETWEEN 'LEGAL' AND 'ILLEGAL' JURISDICTIONS: FINDINGS FROM THE INTERNATIONAL CANNABIS POLICY STUDY

David Hammond, PhD. University of Waterloo, Canada.

Significance: The cannabis market is rapidly evolving, with an increase in the diversity and potency of products. The type of cannabis product used may have important implications for both the potential therapeutic and harmful effects of cannabis; however, there is little data on the different forms of cannabis use and consumption patterns, including differences between jurisdictions that have and have not legalized non-medical cannabis use. Methods: Data are from Wave 1 of the International Cannabis Policy Study, collected from Aug 27-Oct 7, 2018. Respondents (n=27,024) aged 16–65 completed an online survey measuring patterns of cannabis use, quantities and routes of administration. Respondents were recruited from Canada (n=9,976) and US states that had (n=7,362) and had not (n=9,686) legalized non-medical cannabis ('legal' and 'illegal' states, respectively). Results: Dried herb was the dominant form of cannabis reported by past 12-month users across all jurisdictions (77.7%–80.8%). Although the amount of dried herb used per year did not differ by jurisdiction (range: 210.3–229.4 g), those in US 'legal' states were significantly more likely to use dried herb daily or weekly than were those in 'illegal' states and Canada (p<0.001). Use of cannabis concentrates, vaped oils, edibles, and drinks was more prevalent among US 'legal' states than 'illegal' states and Canada (p=0.001). Vaping dried herb was more common in both legal and illegal US jurisdictions than in Canada (p<0.05), whereas Canadians were more likely to smoke dried herb with tobacco (p<0.001). The presentation will also discuss considerations for measuring cannabis consumption and emergent products, such as 'CBD oil' in population-level surveys. Conclusion: The prevalence of cannabis use—and the use of products such as cannabis concentrates, edibles and drinks—was higher in US states that had legalized cannabis. Additional longitudinal research is required to determine whether these differences reflect causal effects of legalization or pre-existing secular trends.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

SYM8C

TRENDS IN CONCURRENT CIGARETTE AND CANNABIS USE ("CO-USE") WITHIN STATE-LEVEL MEDICAL CANNABIS POLICY CONTEXTS: FINDINGS FROM WAVES 1-4 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

Danielle Smith, Master of Public Health (MPH). Roswell Park Cancer Institute, US.

Significance: Concurrent use of tobacco and cannabis ("co-use") is more common than cannabis use alone, and is linked to greater adverse health effects compared to exclusive use of either substance. The U.S. is experiencing increased cannabis liberalization, including greater adoption of state-level medical cannabis policies. The relationship between state-level medical cannabis policy status and trends in cigarette and cannabis use over time remains unknown. Methods: Data are from adults included in Waves 1 (W1) through 4 (W4) of the Population Assessment of Tobacco and Health (PATH) Study (2013-2017, N=33,628). Participants' W1 state of residence was categorized according to medical cannabis policy status at each Wave (legal versus illegal). Current use of cigarettes (everyday or some days), past 30-day cannabis use, and past 30-day co-use was assessed using descriptive analyses and generalized estimating equations. Analyses were weighted; models adjusted for age, sex, race/ethnicity, census region, and time. Results: From Waves 1-4, prevalence of past 30-day cannabis use was 7.2%, 9.1%, 9.9%, 12.0%; while prevalence of current smoking was 21.4%, 20.4%, 19.7%, and 19.3%. Prevalence of past 30-day co-use was 4.1%, 4.9%, 5.0%, and 5.2%. The overall trend of past 30-day cannabis use increased over time (aOR: 1.12, 95%CI: 1.10-1.14); past 30-day cannabis use was 1.19 times higher among those living in states with legal medical cannabis vs those who did not. Odds of current cigarette use decreased over time (aOR: 0.98, 95%CI: 0.97-0.99), and were no different among those living in states with legal medical cannabis. Odds of past 30-day co-use significantly increased over time (aOR: 1.06, 95%CI: 1.05-1.09), and were

higher among those living in states with legal medical cannabis (aOR: 1.16, 95%CI: 1.07-1.25). Conclusions: From 2013-2017, U.S. trends in co-use were more similar to those observed for cannabis use rather cigarette smoking. Environmental elements related to cannabis policy liberalization may contribute, and should be included in dialogues related to comprehensive tobacco control.

FUNDING: Federal

SYM8D

INTERNATIONAL DIFFERENCES IN PATTERNS OF CANNABIS AND CIGARETTE CO-USE AMONG ADULTS FROM THE 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

Shannon Gravely, PhD. University of Waterloo, Canada.

Significance: Cigarette smoking among cannabis users is highly prevalent, and is associated with negative health consequences. It is unknown however, if the extent of co-use differs between countries with varying cannabis regulatory policies. This study examined the difference between countries in: (1) co-use (dual use of cannabis/cigarettes) in the last 12-months and 30-days; and (2) mode of cannabis delivery, frequency of cigarette smoking and cannabis use, and comparative risk perceptions. Methods: 2018 ITC Four Country Smoking and Vaping Survey of 10,035 adult cigarette smokers from Canada (CA), United States (US), Australia (AU), and England (EN). CA and US were considered to have more permissive cannabis policies: US: medical use legal in 34 states; recreational in 10 states; Canada: medical use legal since 2001; data collection completed 3-months prior to recreational legalization). AU and EN require a medical prescription for qualifying conditions (with recreational cannabis illegal). Results: CA had the most prevalent co-use in the past 12-months (36.3%) and 30-days (27.7%) than AU (21.4%, 10.8%), EN (21.6%, 13.7%), and US (29.1%, 21.8%); US was significantly greater than AU and EN. Among past 12-month co-users, US (40.2%) and CA (35.2%) had the highest rates of daily cannabis use, followed by EN (26.3%) and AU (21.7%). A higher proportion of cannabis users were non-daily smokers, with the highest proportion being from AU (94.7%), followed by EN (85.9%), US (83.3%) and CA (79.9%). A greater proportion of co-users in CA (73.6%) and US (78.3%) perceived smoking cannabis as less harmful than cigarettes (EN:60.8%; AU:65.5%). Among all past 30-day co-users, smoking was the most common mode of cannabis delivery; with co-users from EN (86.7%) and AU (79.8%) being more likely to mix it with tobacco than those from CA (33.5%) and US (20.4%). CA and US were also more likely to use other modes of delivery compared to AU and EN (e.g. vaping, dabbing, edibles). Conclusion: Co-use was more prevalent and frequent in countries with more permissive cannabis policies; however, other factors may also account for these differences (e.g. pre-existing cannabis use trends).

FUNDING: Federal; Nonprofit grant funding entity

SYM8E

DO CHANGES IN CIGARETTE SMOKERS' FREQUENCY OF CANNABIS USE INFLUENCE THEIR CHANCES OF SUCCESSFUL SMOKING CESSATION? FINDINGS FROM THE 2016 & 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

Pete Driezen, PhD. University of Waterloo, Canada.

Significance: Cigarette smokers are more likely to use cannabis than non-smokers. Co-use may impede successful smoking cessation. This study examined whether changes in cannabis use frequency influenced tobacco smoking cessation outcomes. Methods: A prospective cohort of representative samples of adult smokers (n=4,480) from Canada, the United States, England, and Australia were surveyed in 2016 and 2018. In each year, smokers were asked how often they typically used cannabis in the previous 12 months. Self-reported use in each year was compared to determine whether usage frequency increased, remained unchanged, or decreased between years. Smoking cessation outcomes, measured in 2018, were any attempt to quit in the previous year, having quit smoking, and having quit for at least 6 months. Weighted multivariable logistic regression estimated the odds of each cessation outcome as a function of changes in cannabis use controlling for sociodemographic and behavioral covariates. Results: Eight percent of smokers who started using cannabis/increased their frequency of use had quit smoking tobacco by 2018 compared to 12% of smokers who did not use cannabis in either year (adjusted OR=0.50, 95% CI: 0.30-0.83). Significantly fewer smokers who started using/increased their frequency of use reported having been quit for at least 6 months by 2018 compared to smokers not using cannabis in either year (2% vs. 8%, respectively, adjusted OR=0.29; 95% CI: 0.14-0.60). Smokers who reduced their usage frequency/stopped using did not differ from non-users in their odds of quitting. Conclusions: Smokers who increased their frequency of using cannabis were less



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likely to successfully quit smoking cigarettes than non-using smokers, while smokers who reduce their frequency of cannabis use do not differ from non-users in achieving successful cessation. These findings have important public health implications given the legalization of non-medical cannabis in different jurisdictions.

FUNDING: Federal; Nonprofit grant funding entity

SYM8F

*DISCUSSANT

Maciej Goniewicz, PhD. Roswell Park Cancer Institute, US.

Dr. Goniewicz will summarize each of the five presentations, highlight the key findings, and discuss implications and future directions.

FUNDING: Federal; Pharmaceutical Industry; Nonprofit grant funding entity

SYM9E

HIGH SCHOOL STUDENTS' USE OF JUUL DEVICES AND JUUL POD FLAVORS BEFORE AND AFTER RETAIL SALES RESTRICTIONS ON CERTAIN FLAVORS WERE IMPLEMENTED

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Significance. In November 2018 JUUL stopped selling mango, cool cucumber, fruit medley, and crème brûlée pods in retail stores over concerns that these flavors disproportionately appeal to youth. However, these flavors continued to be available on JUUL's website. Retail and online sales of classic tobacco, Virginia tobacco, menthol, and cool mint pods continued. We examined rates of past-30-day JUUL device use and flavored pod use among high school students before and after the sales restrictions were enacted to examine the impact of the new sales policy. We anticipated that JUUL device use and restricted flavor use would decrease while unrestricted flavor use, especially cool mint (which previously has been shown to be popular among youth), would increase. Methods. Students from 4 Connecticut high schools completed in-school, computerized surveys in 2018 (May-October; N = 3170) and 2019 (April-June; N = 3074). Students reported on past-30-day JUUL device and flavored pod use. Differences in cross-sectional use rates by year were examined using chi-square analyses. Results. In 2019, significantly fewer students reported past-month JUUL use than in 2018 (2018: 30.2%, 2019: 25.6%) as well as past-month use of all four restricted flavors (mango [62.8%, 36.9%]; cucumber [27.7%, 11.9%]; fruit [23.5%, 11.4%]; crème brûlée [12.3%, 5.0%]; *p*-values < .001). Rates of classic tobacco (5.6%, 4.2%), Virginia tobacco (5.7%, 4.3%), and menthol (10.0%, 8.3%) pod use were similar in 2018 and 2019. However, cool mint pod use was more prevalent in 2019 than in 2018 (62.0%, 68.6%, *p* = .007). Conclusions. Adolescent past-month JUUL use and the use of all four pod flavors that were removed from retail stores decreased from 2018 to 2019. However, rates of restricted flavor use were not zero (e.g., mango 36.9%), and cool mint pod use increased over time (62.0% to 68.6%). Our data suggest that access to cool mint pods should be restricted to further limit youth JUUL use. Future research is needed to determine where youth acquire restricted and unrestricted JUUL pods and whether the use of flavored pods that are compatible with JUUL but are not manufactured by JUUL have increased.

FUNDING: Federal

SYM9F

COLLEGE STUDENTS PERCEPTIONS ABOUT JUUL AND NICOTINE ADDICTION

Page D. Dobbs, Christopher M. Dunlap, Elise J. Hodges, Julia S. Oehlers, Marylley Y. Chavez, Marshall K. Cheney. University of Oklahoma, Norman, OK, USA.

Introduction: One of the most popular pod-based electronic cigarette (e-cigarette) brands, JUUL, contains higher levels of nicotine than other e-cigarettes. To date, no studies have examined college students' perceptions of addiction to JUUL. The current study examined the relationship between nicotine dependence, self-reported nicotine and JUUL addiction, and perceived severity of nicotine and JUUL addiction in college students. **Methods:** This sequential explanatory mixed-methods design employed a sample of college students from a large southwestern University. Current JUUL users completed a cross-sectional survey (n=608) in March 2019, and 50 survey participants

took part in follow up interviews in April 2019. Survey measures included ever and past 30-day use of JUULs, perceptions of addiction, future JUUL use, and an adapted version of the Penn State E-Cigarette Dependence Index. Independent t-tests were used to explore differences in JUUL dependence between those who would/would not tell a friend they were addicted to JUULs and nicotine. Interview participants were asked about perceived addiction and future JUUL use. Qualitative data were coded independently by two coders using NVivo, reviewed by a senior coder, then analyzed for themes. **Results:** Survey participants who believed they were addicted to JUULs had significantly higher JUUL dependence scores (M=9.32, SD=4.26; scores ranged from 0-20) than those who did not (M=4.40, SD=3.95; *p* < .001). Overall, 49% of participants indicated they were addicted to JUUL, while only 33.7% reported they were addicted to nicotine. The point of integration between the quantitative and qualitative data was the minimization of JUUL addiction. Half (53.6%) of participants agreed with the statement "I have an addictive personality" and described JUUL addiction as more socially acceptable than nicotine, equating JUUL addiction to caffeine, coffee, or cell phone addiction. Many denied addiction to JUUL and claimed they could quit anytime; 40% expected to quit using JUULs after college. **Conclusions:** College student JUUL users reported moderate levels of dependency, yet minimized their growing addiction, placing them at increased risk of long-term nicotine addiction. More research is needed about college students' perceived and measured addiction to JUUL and future transitions to other tobacco product.

FUNDING: Federal; Academic Institution

SYM9A

CROSS-SECTIONAL ANALYSIS OF VARIOUS E-CIGARETTE DEVICE TYPES AMONG HIGH SCHOOL ADOLESCENTS IN CONNECTICUT FROM 2017-2019

Krysten W. Bold, PhD¹, Grace Kong¹, Meghan E. Morean², Ralitz Gueorguieva¹, Deepa R. Camenga¹, Patricia Simon¹, Danielle R. Davis¹, Suchitra Krishnan-Sarin¹. ¹Yale University School of Medicine, ²Oberlin College.

Significance: Rates of adolescent e-cigarette use, including JUUL, have increased in recent years. This study examined cross-sectional trends in e-cigarette devices used by youth to inform prevention and tobacco regulation efforts. Methods: School-wide surveys were conducted in 4 Connecticut high schools in 2017 (n=2945), 2018 (n=3170), and 2019 (n=3075) that assessed the use of specific e-cigarette devices: cigalike, vape pen, mods, JUUL, and other non-JUUL pod devices (added in 2018 and 2019). Analyses compared use of e-cigarette devices among ever and current (i.e., past-month) e-cigarette users, as well as frequency (i.e., the number of days used out of the past 30) over time. Results: Ever and current use of JUUL increased significantly from 2017-2018 (78% of past-month users). Frequency of JUUL use among past month users increased from 2017-2018 (*p*=.002) from 11 to over 13 out of 30 days and remained stable in 2019. Lifetime use of other pod devices and frequency of use in the past month did not significantly change during the two years assessed, although rates of current use declined from 2018-2019, *p*<.001. Given that JUUL was the most commonly used device, a binary logistic regression model predicted current JUUL use (vs. other devices), controlling for time, demographics (i.e., age, sex, race/ethnicity, socioeconomic status), and tobacco use variables (i.e., current cigarette use, other tobacco use, peer and parent tobacco use). Current use of JUUL was significantly associated with time (*p*<.001), younger age (*p*=.004), higher SES (*p*<.001), White (vs. Hispanic or Black, *p*=.008), and peer tobacco use (*p*=.015). Conclusion: Use of various e-cigarette devices changed over time among CT youth, and JUUL remained the most common. Findings identified specific demographic characteristics associated with use of JUUL compared to other devices. Targeted tobacco regulation and prevention efforts are needed to prevent youth use of these devices.

FUNDING: Federal

SYM9B

E-CIGARETTE DEVICE TYPE, FLAVOR, CLOUD SIZE, AND NICOTINE CONTENT ASSOCIATED WITH YOUTH BELIEFS: A DISCRETE CHOICE EXPERIMENT

Benjamin W. Chaffee, DDS, MPH, PhD¹, Janelle Urata¹, Elizabeth T. Couch¹, David Cash², Miranda Werts¹, Bonnie Halpern-Felsher². ¹University of California San Francisco, ²Stanford University.

Objectives: Tobacco product characteristics are potential regulatory targets and likely influence adolescents' tobacco perceptions and behaviors. This study assessed the independent contributions of specific e-cigarette product attributes to adolescents' beliefs. Methods: In an in-person survey of 713 students at four rural high schools in



California (USA), participants were randomized to one of two discrete choice experiments (e-cigarettes or smokeless tobacco). In each experiment, participants were presented pairs of randomly generated hypothetical tobacco products that, for e-cigarette pairs, differed in device type (cigalike, tank, drip-mod, pod), flavor (tobacco, dessert, fruit, mint, "unicorn"), vapor cloud (large, small), and nicotine amount (none, low, moderate, high). For each pair, participants were asked about which product they were more curious, and which would be more dangerous, give a bigger "buzz," and be easier to use. Conditional logistic regression was used to quantify the independent contribution of product attributes to participants' choices, with interaction terms added to assess differences according to participant characteristics. Results: Each e-cigarette attribute was independently associated with multiple e-cigarette product beliefs. Refillable tanks and pod devices were viewed as easier to use and garnered more curiosity than cigalike or drip-mod devices. All non-tobacco flavors were associated with more curiosity and ease of use and lower perceived danger and buzz. Higher nicotine content was associated with less curiosity and ease of use and greater perceived danger and buzz. Smaller vapor cloud products were viewed as less dangerous, offering less buzz, and easier to use. Associations did not differ by gender. Tobacco ever-users held stronger opinions about device type, while tobacco naïve participants more strongly associated flavor with danger and buzz. Conclusions: E-cigarette attributes, including device type, flavor, and cloud size, help to convey product qualities to adolescents. These beliefs may not be accurate but may increase the youth appeal of certain devices. Regulation of such attributes could reduce youth use.

FUNDING: Federal

SYM9C

APPEAL OF JUUL AMONG ADOLESCENTS

Grace Kong, PhD¹, Meghan E. Morean², Krysten W. Bold¹, Harmanpreet Bhatti¹, Deepa R. Camenga¹, Asti Jackson¹, Suchitra Krishnan-Sarin¹. ¹Yale University School of Medicine, ²Oberlin College.

Background: JUUL use among adolescents has grown at an exponential rate since 2015. Understanding why and how JUULs appeal to youth is critical to informing youth prevention efforts. We examined adolescents' reasons for liking/disliking JUULs and their associations with frequency of JUUL use. Methods: Anonymous cross-sectional surveys were conducted in 4 high schools in southeastern Connecticut in 2018 (N=3170). The survey assessed frequency of JUUL use in the past month and reasons for liking/disliking JUULs, which included pharmacological effects, product characteristics, peer influence, comparisons to other e-cigarettes, and concealability. Results: 30.2% of students reported using a JUUL in the past month (i.e., current users). Current users reported JUUL use on an average of 13.6 days (SD=11.7) (including 25% who reported daily use). The top reasons for liking JUULs among current users were "it gives me a buzz" (52%), "I like the flavors" (43%), and "my friends use it" (36%). The top reasons for disliking JUULs were "The pods are expensive" (57%), "nicotine is too high" (20%), and "It gives me a headache" (18%). Adjusted regression analyses indicated that positive pharmacological effects and product characteristics were associated with more frequent JUUL use, while peer influence was negatively associated with use frequency. Additionally, being White (vs. non-white), older, owning a JUUL, using other e-cigarettes, and using other non-e-cigarette tobacco products were also positively associated with JUUL use frequency. Reasons for disliking were not associated with frequency of use in the adjusted regression model. Conclusions: JUULs appealed to youth for several reasons but positive pharmacological effects and product characteristics were most related to frequent JUUL use. Comprehensive tobacco control policies that target appealing characteristics are needed to prevent JUUL use among youth.

FUNDING: Federal

SYM9D

HOW AND WHY ADOLESCENTS AND YOUNG ADULTS ARE USING DIFFERENT POD-TYPE E-CIGARETTES

Bonnie Halpern-Felsher, PhD, FSAHM, Karma McKelvey. Stanford University.

Background: Adolescents' and young adults' (AYA) use of e-cigarettes has dramatically increased, owing largely to Juuls/pod-based e-cigarettes. This study provides detailed data on the brands of pod-type e-cigarettes AYA are using and sharing, perceptions of the nicotine levels of each product, whether they are mixing brands of devices with different brands of e-juices, and their reasons for using. Data of this nature are necessary to inform product regulation and develop public health and tobacco control messaging. Methods: Data were collected from January 22 to March 19, 2019 from a convenience sample recruited from ten large high schools in California with racially/ethnically and socioeconomically diverse populations. Participants completed an online

survey (N=445; mean age=20.1 (SD=1.66); 64.8% female (n=278); 38.8% (n=161) "white," 23.9% (n=99) each "more than one race" and "Asian," 13.5% (N=56) other; 36.9% (n=160) Hispanic). Results: A majority had heard of Juul and just over one-quarter reported ever-use of Juul. Over half of Juul ever-users reported past 30-day use. Half of ever-users of pods indicated that they share their devices. Juul was most often considered a "type of vape" (30.2%); Suorin Drop a "type of nicotine-delivery system" (33.9%); and Myblu a "type of e-cigarette," (40.9%). Most AYA didn't know how much nicotine was in each pod, with only 6.9% correctly assessing Juul's nicotine content of 59mg/ml. AYAs mostly used pods because they are easy to hide and the smell is less obvious than other vapes. They declined using pods because of their nicotine content. Conclusions: Our findings indicate AYA harbor confusion about pod-based e-cigarettes, including nicotine content, usage patterns, and labeling, suggesting regulation and education about these products is needed.

FUNDING: Federal

SYM10A

DOPAMINE D3 AS A TARGET FOR TREATMENT: OVERVIEW OF PRECLINICAL RESULTS AND INSIGHT FROM RECENT HUMAN TRANSLATIONAL STUDIES

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The dopamine D3 receptor (D3R) has been shown in preclinical studies to control reinstatement of drug seeking and motivation for drugs. A D3R gene variant, Ser9Gly (rs6280) has been linked to nicotine dependence, yet the mechanisms underlying its involvement in nicotine dependence is unclear. Here, an overview of preclinical studies results will be provided. In addition, results from a human translational study investigating the relationship between the Ser9Gly variant and measures of both nicotine reinforcement and cue-elicited craving will be presented. Phenotypes of smoking behaviors were assessed in genetically grouped (Glycine vs. No Glycine groups) current smokers (n=103, cigarettes per day = 10). Laboratory measures included a forced choice session, to measure relative reinforcement of nicotine (nicotinized vs. denicotinized cigarette), and a cue-reactivity session, to measure cue-elicited craving (smoking vs. neutral cues). The forced choice procedure revealed that subjective ratings were significantly higher in response to nicotinized compared to denicotinized cigarettes; however the Ser9Gly variant did not significantly influence this effect. By comparison, smoking cues elicited greater craving over time compared to neutral cues, and Glycine carriers of the Ser9Gly D3R variant seem to experience a significant blunted cue-elicited craving effect. Results support D3R involvement in drug seeking and in nicotine cue reactivity. However, more research is needed using smoking cessation clinical trials.

FUNDING: Academic Institution

SYM10B

PROPRANOLOL AND SMOKING CUES: A TRANSLATIONAL INVESTIGATION OF NEURAL AND BEHAVIORAL EFFECTS

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A rapidly developing preclinical and clinical literature implicates the noradrenergic system in the retrieval and reconsolidation of emotionally-laden memories, such as episodes of prior drug use. Disruption of this system may mitigate the impact of environmental cues on craving and smoking behavior. However, translational efforts have been hampered by limited knowledge of the neural and behavioral effects of noradrenergic medications in humans. In this project, cigarette smokers (n = 42) were trained to photograph their personal smoking and non-smoking environments. These images, along with standard environments and proximal cues, were presented to participants during an MRI scan. Two hours prior to scanning, they were administered a single dose of propranolol hydrochloride (40 mg; IR) or placebo in a double-blind fashion. Participants also attended a laboratory session in which they were again administered propranolol or placebo, then completed a brief in-lab task during which they viewed their personal smoking environments and were permitted to smoke ad lib. Video recordings were obtained and used to code for relevant indices of smoking behavior. During the MRI scan, propranolol reduced self-reported urge to smoke in response to smoking cues relative to neutral cues (F = 11.6, p < .001). Propranolol also reduced neural activation to smoking cues relative to neutral cues in the left hippocampus and parahippocampal gyrus. Across both indices, effects were strongest for proximal cues. However, on the laboratory smoking task propranolol had no effect on number of cigarettes smoked (p = .834) or total puffs (p = .351) and actually reduced the time to first cigarette (p = 0.030).



Findings indicate propranolol can reduce smoking cue reactivity and suggest this effect may be mediated by comparable neural pathways to those seen in pre-clinical studies. However, the clinical utility of these effects remains unclear. Nonetheless, propranolol may hold promise as a standalone or adjuvant smoking cessation treatment and further exploration of propranolol and other pharmacological agents targeting the noradrenergic system are certainly warranted.

FUNDING: Federal

SYM10C

EFFECT OF GALANTAMINE ON COGNITION AND SMOKING ABSTINENCE IN TREATMENT-SEEKING SMOKERS USING A MEDICATION SCREENING PARADIGM

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Despite effective pharmacotherapies for smoking cessation, most smokers relapse within the first few days of abstinence. Procedures for early medication screening provide a practical approach to identify novel treatments. Withdrawal-related cognitive impairment, a common withdrawal phenotype that is predictive of smoking relapse, is a promising therapeutic target. The acetylcholinesterase inhibitor, galantamine (GAL), attenuates nicotine self-administration and withdrawal-related cognitive deficits in rodents. The objective of the current proof-of-concept study was to evaluate whether these preclinical findings translate to humans using a well-validated medication screening paradigm. In this double-blind, placebo-controlled, phase II clinical trial, treatment-seeking smokers were randomized to receive GAL or placebo (PLA) for 23 days. Neurocognitive measures (e.g., working memory, attention, response inhibition) were assessed at baseline, after 2 weeks on treatment, and again following a 24-hour abstinence period. This was followed by a scheduled smoking lapse. All smokers were then asked to try their best to abstain from cigarettes for 7 days (monitored abstinence, biochemically verified). Of the 61 (28 GAL) smokers who completed the study, 74% identified as African American and 41% were female. Subjects were, on average, 44 years old (SD=10.9), smoked 15.1 cigarettes per day (SD=6.1), were moderately nicotine dependent (5.1, SD=1.8), and had a Shipley IQ of 102.9 (SD=7.5). There were significant group x visit interactions for working memory and response inhibition ($p < .05$) indicating that GAL attenuated withdrawal-related deficits vs. PLA; there were no effects on attention. During the monitored abstinence period, there were no medication effects on total number of days abstinent (PLA mean=3.7 days; GAL mean=3.6 days, $p = .8$) or total number of cigarettes smoked ($p = .8$). While galantamine rescued deficits in cognition during withdrawal, the lack of an effect on smoking behavior suggests galantamine does not represent a viable treatment for smoking cessation.

FUNDING: Federal; State

SYM10D

LORCASERIN AND NICOTINE PATCH FOR SMOKING CESSATION AND AMELIORATION OF WEIGHT GAIN

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Lorcaserin is a serotonin 2C receptor agonist that operates within appetitive brain pathways and is FDA approved for weight loss. A previous study demonstrated the efficacy of lorcaserin alone for smoking abstinence, but abstinence rates were relatively low (15.3%). Pre-clinical studies have shown that lorcaserin decreases nicotine self-administration in nicotine-dependent rats but that the effect is far more pronounced when lorcaserin is given together with nicotine. We conducted a trial in which 61 adult daily smokers were asked to quit smoking using a combination of lorcaserin and nicotine patch. Outcomes included 4-week continuous smoking abstinence at the end of treatment (weeks 7-10 post quit attempt), weight change, ad libitum smoking, withdrawal symptoms, and ratings of cigarette reward. Adherence to and tolerability of lorcaserin and nicotine patch were good. Biochemically confirmed continuous smoking abstinence from 7 to 10 weeks post-quit attempt was 31.1%. Participants who quit smoking showed no weight gain and in fact showed a mean weight loss of 0.16 kg (SD=3.27) over the study period. During the pre-quit randomization period, lorcaserin vs. placebo reduced the impact of smoking to relieve craving for cigarettes as well as reducing the enjoyment of smoking-related respiratory sensations. The combination of lorcaserin and nicotine patch was well tolerated, was associated with a relatively high smoking abstinence rate

compared to a previous study of lorcaserin alone, and effectively prevented weight gain associated with quitting smoking. We will discuss findings from animal studies as well as our recent human trial.

FUNDING: Federal

SYM11A

NICOTINE E-CIGARETTE VAPOR INHALATION EFFECTS ON NICOTINE & COTININE PLASMA LEVELS AND SOMATIC WITHDRAWAL SIGNS IN ADULT MALE WISTAR RATS

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Rationale: Forced chronic nicotine exposure procedures have evolved rapidly in recent years, culminating in a recent novel method that uses electronic cigarette-type technology to deliver aerosolized drugs to rodents in standard housing chambers. Objectives: The aim of the current work was to use electronic cigarette-type technology to test concentration-dependent effects of nicotine on blood-nicotine concentrations, blood-cotinine concentrations, and somatic withdrawal signs over time in rats. Methods: We exposed male Wistar rats to different concentrations of nicotine over days, then we measured blood concentrations of nicotine and cotinine, the major proximate metabolite of nicotine, as well as spontaneous and precipitated somatic withdrawal signs over time (across days of exposure and over hours after termination of vapor exposure). Results: We report that exposing male Wistar rats to forced nicotine vapor inhalation using an apparatus that employs e-cigarette technology produces somatic withdrawal symptoms and measurable blood-nicotine and blood-cotinine levels that change according to 1) concentration of nicotine in vape solution, 2) number of days of nicotine vapor exposure, 3) time since termination of nicotine vapor exposure, and 4) whether withdrawal was spontaneous or precipitated (by mecamlamine). Conclusions: The data presented here provide parameters that can be used as a reasonable starting point for future work that employs forced nicotine vapor inhalation in rats using e-cigarette technology, although many parameters can and should be altered to match the specific goals of future work.

FUNDING: Federal

SYM11B

CELLULAR AND BEHAVIORAL CONSEQUENCES OF ACUTE EXPOSURE TO ELECTRONICALLY VAPORIZED NICOTINE IN ADULT MALE C57BL6J MICE

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Rationale: The use of electronically vaporized nicotine ('vaping') is increasing in prevalence and popularity, particularly among younger populations. However, the effect of vaping on neuronal function and/or central neuroadaptations underlying behaviors associated with nicotine use remains unclear. Objectives: Determine the effect of electronic nicotine vapor exposure on neuronal populations implicated in the reinforcing properties of nicotine and on behaviors associated with nicotine exposure. Methods: We exposed male C57Bl6j mice to electronic nicotine vapor [12% nicotine in 70:30 polyethylene glycol [(PG)/vegetable glycerol (VG)] or PG/VG vapor alone for a three hour session (3 sec vapes, 10 minute intervals between vapes). Immediately following vapor exposure we performed assessments of thermoregulation and locomotion and in separate cohorts collected brains for electrophysiological recordings of central amygdala (CeA) and ventral tegmental area (VTA) neurons. Results: Immediately following a single three-hour session of intermittent nicotine vapor inhalation, mice exposed to electronically vaporized nicotine displayed significantly higher serum nicotine and cotinine levels as compared to PG/VG controls. Mice exposed to electronically vaporized nicotine also displayed a significant reduction in core body temperature and significant reductions in distance traveled in an open field as compared to PG/VG controls. Acute exposure to electronically vaporized nicotine did not significantly alter the passive membrane properties or baseline inhibitory transmission in CeA or VTA neurons, however CeA neurons from mice exposed to electronically vaporized nicotine did display significantly higher baseline firing rates as compared to PG/VG controls. Conclusions: Acute exposure to electronically vaporized nicotine produces short term deficits in thermoregulation and locomotion. In addition, acute nicotine significantly increases the baseline excitability of CeA neurons, which may contribute to the reinforcing effects of nicotine vapor exposure.

FUNDING: Federal



SYM11C

ENHANCEMENT OF ELECTRONIC CIGARETTE LIQUID INTAKE BY SPECIFIC FLAVORS IN A MOUSE MODEL OF VOLUNTARY CONSUMPTION

Anna M. Lee, PhD, Jenna Robinson, Alyssa Wong, Scott McElroy. University of Minnesota.

Background: The prevalence of electronic cigarette use has dramatically increased over the last decade, yet our understanding of the addiction-relevant properties of electronic cigarette liquids (e-liquids) has lagged behind their use. Our goals were to evaluate the consummatory and reinforcing properties of e-liquids, compare the effects of e-liquid with nicotine alone, and determine the impact of different flavors on consumption and reinforcement in a mouse model. **Methods:** Male C57BL/6J adult mice were assessed for voluntary oral consumption of e-liquid, nicotine-free e-liquid or nicotine. We evaluated the intake of nicotine and equivalent e-liquid solutions ranging in concentration from 30-200 microgram/mL in 2- or 3-bottle choice tests. In these bottle choice tests, mice had access to one or two bottles of drug and a bottle of water for 24 hours a day. We tested the effect of fruit and tobacco flavoring alone, and all solutions were unsweetened. A separate group of drug naïve male mice were tested for conditioned place preference with 0.5, and aversion with 2.0 mg/kg nicotine, e-liquid, and equivalent dilutions of nicotine-free e-liquid. **Results:** Male, adult C57BL/6J mice showed enhanced consumption and preference for the fruit-flavored e-liquid compared with equivalent concentrations of nicotine alone (2-way RM ANOVA for interaction between concentration and formulation, $P < 0.0001$, $n = 12$ /gp). Importantly, this enhancement was not driven by the flavor alone, as consumption and preference of the nicotine-free fruit-flavored e-liquid was less than the nicotine-containing formulation ($P < 0.01$). Moreover, this enhancement of consumption and preference was specific to fruit flavoring, as we did not observe the same effect with tobacco flavoring. Place conditioning with fruit-flavored e-liquid was not significantly different compared with nicotine alone ($P = 0.15$, $n = 12$ -13/gp). **Conclusion:** Our results demonstrate that fruit flavoring, but not tobacco flavoring, enhanced the oral consumption and preference of e-liquid compared with nicotine alone in mice. Peripheral administration of fruit-flavored e-liquid produced similar levels of reinforcement as nicotine alone.

FUNDING: Federal

SYM11D

EFFECTS OF E-CIGARETTE AEROSOL EXTRACT AND NICOTINE ALONE ON NICOTINE'S AVERSIVE AND REINFORCING EFFECTS IN ADOLESCENT RATS

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Animal models for evaluating the abuse liability of electronic cigarettes (ECs) in adolescents are needed to inform FDA regulation of these products. We previously reported that EC liquids containing nicotine and a range of non-nicotine constituents (e.g., propylene glycol, vegetable glycerin) had reduced aversive effects compared to nicotine alone in adult rats as measured using intracranial self-stimulation, but that these formulations did not differ in an i.v. self-administration (SA) model. This goal of this study was to compare the aversive and reinforcing effects of nicotine alone and EC aerosol extracts in adolescent rats. Aversion was measured using conditioned taste aversion (CTA) so that it could be tested during the brief adolescent period. At a nicotine dose of 1.0 mg/kg, CTA to Vuse Menthol EC extract, but not Aroma E-Juice EC extract, was attenuated compared to nicotine alone during repeated CTA tests. At a nicotine dose of 0.5 mg/kg, CTA to Vuse Menthol EC extract did not differ from nicotine alone during the first CTA test, but extinguished more rapidly across repeated tests. Neither EC extract differed from nicotine alone in terms of acquisition or elasticity of demand in a 23 hour/day SA model. Our data indicate that Vuse Menthol EC extract had reduced aversive effects but similar reinforcing effects compared to nicotine alone in adolescent rats. These findings are generally consistent with the effects of EC liquid in adults. Further evaluation of EC liquid and extracts in SA models in which nicotine's aversive effects may better manifest (e.g. during dose escalation) is needed. These models may be useful for anticipating the abuse liability of ECs in adolescents and for modeling FDA-mandated changes in product standards for nicotine or other constituents in ECs.

FUNDING: Federal; Academic Institution

SYM12E

MODELING TOBACCO INDUSTRY RESPONSES TO MENTHOL CIGARETTE REGULATIONS

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Significance: Menthol is the only remaining flavoring permitted in cigarettes in the United States. These products are disproportionately smoked by minority groups such as African Americans, potentially exacerbating existing health disparities. Prior studies suggest that a menthol ban could encourage quitting among those most affected, thereby averting hundreds of thousands of premature deaths. Despite submitting an Advanced Notice of Proposed Rulemaking on menthol regulations in 2013, the FDA has yet to submit a proposed rule on the matter. To understand the lack of subsequent action, it is critical to consider the process of policy creation including the reaction of key stakeholders including the tobacco industry to proposed rules. Game theory allows us to examine the strategic logic of key actors in the regulatory system, providing insight into barriers facing efforts to reduce the burden of menthol cigarettes. **Methods:** We developed a game theoretic model to represent the regulatory decision-making process. Our model represents tobacco companies as players with the ability to respond to proposed FDA rules (ban, product standard, or advertising restriction). We assumed the FDA must balance signals from stakeholders including the executive branch, industry actors, and public health advocates, as well as internal agency budgetary concerns. We base tobacco company incentives on their net profit. **Results:** If the FDA receives conflicting signals from its stakeholders, we find that menthol regulations that substantially reduce sales cannot be obtained on the equilibrium path. Tobacco industry actors are strongly incentivized to use delaying tactics against any potential menthol regulation, diluting any public health impact, and increasing the chance that any regulation is withdrawn. **Conclusion:** The modeling suggests that despite of their potential public health benefits, strong menthol regulations appear unlikely to be successfully promulgated and upheld at present. However, our modeling framework suggests that opportunities to affect the strategic calculus for both the FDA and industry actors do exist. In particular, public health actors may wish to target legislative and executive branch veto points or increase litigation. Additionally, regulators could negotiate a rule with industry actors that have a competitive incentive to support menthol regulations due to lower market presence relative to competitors.

FUNDING: Federal

SYM12F

SALES RESTRICTIONS SIGNIFICANTLY REDUCE THE AVAILABILITY OF MENTHOL TOBACCO IN MINNEAPOLIS AND ST. PAUL

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Significance: Menthol cigarettes are linked to increased initiation among youth, higher levels of addiction and decreased quitting, especially among African Americans. In the absence of a federal ban on menthol, local governments are exercising their authority to enact sales restrictions on menthol tobacco products. In 2017, Minneapolis and St. Paul were among the first U.S. cities to restrict the sale of menthol tobacco products to adult-only tobacco shops and liquor stores. The purpose of this study was to examine changes in the availability and marketing of these products following policy implementation. **Methods:** Retail store audits were conducted two months pre- and post-policy implementation. Tobacco retail stores including intervention stores, tobacco shops, and liquor stores, were randomly selected from city licensing lists in Minneapolis ($n = 60$) and St. Paul ($n = 60$), and comparison stores were selected from Brooklyn Park ($n = 19$), Maplewood ($n = 18$), Burnsville ($n = 18$), and Fridley ($n = 18$). The presence of menthol cigarettes, little cigars/cigarillos, e-cigarettes, smokeless, hookah, and blunt wraps were assessed along with the number of ads and promotions for menthol tobacco products. **Results:** The majority of Minneapolis intervention stores (84.4%) and all St. Paul intervention stores were compliant with the menthol policy. In contrast, menthol was available in 100% of comparison stores pre- and post-policy. Menthol tobacco continued to be available in most exempted tobacco shops and liquor stores post-policy implementation (Minneapolis 100.0%; St. Paul 83.3%). Two Minneapolis convenience stores remodeled and added interior tobacco shops, allowing them to legally continue selling menthol tobacco products. Significant decreases in menthol marketing inside stores were observed post-policy ($p < .001$). **Conclusions:** Study findings demonstrate



a high rate of compliance, indicating that sales restrictions can significantly reduce the availability of menthol tobacco products. However, challenges to policy adherence underscore the need for continued monitoring and enforcement action.

FUNDING: Nonprofit grant funding entity; Other

SYM12A

EVALUATING THE IMPACT OF MENTHOL CIGARETTE BANS ON CESSATION AND SMOKING BEHAVIOURS IN CANADA: FINDINGS FROM THE 2016-18 ITC FOUR COUNTRY SMOKING AND VAPING SURVEYS

Janet Chung-Hall, PhD. University of Waterloo.

Objectives. Researchers and advocates have called for bans on menthol tobacco products to curb smoking. Canada is one of the first countries in the world to implement a menthol cigarette ban. We conducted a longitudinal evaluation of the impact of menthol bans implemented in 7 Canadian provinces between 2016 and 2018. **Methods.** Data are from Waves 1 and 2 of the ITC 4 Country Smoking and Vaping Survey, a national cohort survey of 1319 adult smokers (1169 non-menthol smokers; 150 menthol smokers) in Canada, surveyed before and after the implementation of menthol bans in Quebec, Ontario, Prince Edward Island, Newfoundland & Labrador, British Columbia, Saskatchewan, and Manitoba. Multivariate logistic regression models used to identify the associations between pre-ban menthol smoking status and post-ban quit attempts; quit success; use of menthol cigarettes; and switching to use of menthol e-cigarettes (ECs), non-menthol ECs, and non-menthol cigarettes. **Results.** After menthol bans, menthol smokers were more likely to have made a quit attempt (60% vs. 48%, $p < 0.01$) than non-menthol smokers. After bans, less than 2% of menthol smokers switched completely to non-menthol and menthol ECs (no differences vs. non-menthol smokers); 55% switched to non-menthol cigarettes; and 21% continued to smoke menthol cigarettes, with convenience stores (61%) identified as the most common site of purchase, followed by First Nations reserves (20%). **Conclusions.** Menthol cigarette bans in Canada led to increased quitting behaviours among menthol smokers compared to non-menthol smokers, extending the findings of Chaiton et al.'s (2019) evaluation of Ontario's menthol ban. Few menthol smokers switched to vaping after bans. The majority of menthol smokers switched to non-menthol cigarettes after bans; however, 21% reported purchasing menthol cigarettes despite bans, underscoring the need to strengthen enforcement. These findings suggest that menthol bans are effective for increasing smoking cessation and decreasing menthol cigarette use, and highlight the benefits of banning menthol in other countries.

FUNDING: Federal; State

SYM12B

REASONS AND STRATEGIES FOR SMOKING CESSATION REPORTED BY FORMER MENTHOL SMOKERS AFTER IMPLEMENTATION OF A MENTHOL CIGARETTE BAN IN ONTARIO, CANADA

Eric Soule, PhD. Eastern Carolina University.

INTRODUCTION: Menthol cigarettes were banned in Ontario, Canada on January 1st, 2017. Understanding menthol smokers' behaviors after implementation of the ban can inform policy development in other jurisdictions. We used concept mapping, a mixed-method approach, to describe how menthol cigarette smokers quit smoking after the Ontario menthol ban. **METHODS:** In 2019, participants who reported daily or non-daily menthol cigarette smoking before the menthol ban and smoking abstinence 24 months after the ban ($n=62$; 53.2% women; mean age=43.6, $SD=12.5$) completed an online survey and brainstormed statements that completed the prompt: "After the menthol cigarette ban, a specific way I quit/reduced my cigarette smoking, a specific reason I was able to quit/reduce my cigarette smoking, or something that helped me quit/reduce my cigarette smoking was..." Participants sorted a final list of 57 statements into groups of similar content and rated statements on how true each statement was for them (1 – Definitely NOT true to 7 – Definitely true). Multidimensional scaling analysis identified thematic clusters. **RESULTS:** Six clusters were identified and from highest to lowest rating included Mental and Environment Changes, Direct Ban Impacts, Health Reasons, Cues to Action, Family and Friends, and Cessation Strategies. The highest rated statements (i.e., most true) suggested many participants were motivated to quit smoking before or after the ban and 30.7% of participants believed the menthol ban helped with smoking cessation. Some of the lowest rated statements included using nicotine replacement therapy products, medication (i.e., Champix), or other tobacco products suggesting these strategies were less common. Statement ratings suggested

many smokers quit without using replacement products or medication, but modifying cognitions and avoiding smoking cues were common. **CONCLUSIONS:** The menthol ban aided some menthol smokers to quit, while others reported the ban did not play a role in smoking cessation. These data suggest the menthol ban had direct and indirect effects on smoking reduction behavior. Campaigns supporting similar bans should target both types of effects.

FUNDING: Federal

SYM12C

BAN ON MENTHOL-FLAVOURED TOBACCO PRODUCTS PREDICTS CIGARETTE CESSATION AT TWO YEARS: A POPULATION COHORT STUDY

Michael Chaiton, PhD. University of Toronto.

ObjectivesThe province of Ontario, Canada, banned the use of menthol-flavoured tobacco products as of January 1st, 2017. The long-term impact of a menthol ban on smoking behaviour has not been previously evaluated two years after the implementation. **Methods:** Population cohort study with baseline survey conducted September-December 2016 and follow up January-July 2019 among residents of Ontario, Canada, 16 years old and over who reported current smoking (past 30 days) at baseline survey and completed follow up ($n=776$) including 161 reporting smoking menthol cigarettes daily, 366 reported smoking menthol cigarettes occasionally, and 251 were non-menthol cigarette smokers. Odds of making a quit attempt and not smoking in the past six months at follow up were estimated with logistic regression controlling for smoking and demographic characteristics at baseline. **Results** At follow up, 72% of daily menthol smokers reported making a quit attempt since the ban compared to 74% of occasional menthol smokers and 57% of non-menthol smokers (adjusted odds ratio (aOR) for daily menthol smokers compared to non-menthol smokers: 2.03; 95% CI 1.30-3.16). At follow up, 25% of daily menthol smokers reported being quit for at least 6 months compared to 26% of occasional menthol smokers and 18% of non-menthol smokers (aOR for daily menthol smokers compared to non-menthol smokers: 2.03; 95% CI 1.18, 3.51). **Conclusions**The study found higher rates of quitting among daily and occasional menthol smokers in Ontario two years after the implementation of a menthol ban compared to non-menthol smokers. Our findings suggest that restrictions on menthol may lead to substantial improvements in public health.

FUNDING: Federal

SYM12D

THE EFFECTS OF IMMEDIATE VERSUS GRADUAL CIGARETTE NICOTINE REDUCTION AMONG MENTHOL AND NON-MENTHOL SMOKERS

Rachel Denlinger-Apte, PhD. Brown University.

Nearly 30% of cigarettes sold in the US are characterized as menthol cigarettes, so it is important to examine how interactions between menthol flavoring and nicotine content may affect the potential benefits of a nicotine reduction policy. Smokers ($N=1,250$) were randomly assigned to an immediate nicotine reduction condition (0.4 mg/g nicotine), a gradual nicotine reduction condition (15.5 to 0.4 mg/g with five dose changes) or a normal nicotine control condition (15.5 mg/g) for 20 weeks. Based on preference, participants received menthol or non-menthol research cigarettes. Linear and logistic regression analyses examined if menthol flavoring moderated the treatment effects (immediate vs control; gradual vs control) on smoking behavior (cigarettes per day [CPD], abstinence) and biomarkers of nicotine and toxicant exposure (breath carbon monoxide [CO]; urinary total nicotine equivalents [TNE] and 2-cyanoethylmercapturic acid [CEMA]). At baseline, menthol smokers reported fewer CPD (14.8 vs 19.1) and had lower TNE (53.0 vs 70.4 nmols/mg) and CO levels (17.7 vs 20.5 ppm) than non-menthol smokers ($p < .05$). At Week 20, menthol smokers in both active conditions experienced smaller reductions (ratio of geometric means - active condition/control condition) relative to non-menthol smokers for TNE (immediate: 0.22 [menthol] vs 0.1 [non-menthol]; gradual: 0.14 vs 0.06) and CEMA levels (immediate: 0.57 vs 0.37; gradual: 1.01 vs 0.74) ($p < .05$ for the interactions). In the immediate reduction condition, menthol smokers had smaller reductions in CPD (-6.4 vs -9.3), CO levels (-4.4 vs -7.4 ppm), and lower odds of abstinence (OR=2.0 vs 8.2) than non-menthol smokers ($p < .05$). In the gradual condition, menthol smokers did not experience significant treatment effects for CPD, CO, or abstinence. **Discussion** In the immediate reduction condition, menthol smokers experienced smaller treatment effects than non-menthol smokers, indicating potentially attenuated policy



benefits. In the gradual condition, menthol smokers did not have significant reductions in smoking behavior, indicating that a gradual reduction approach may not be optimal for menthol smokers.

FUNDING: Federal

SYM13A

THE CONCEPTUAL FOUNDATION OF THE ITC FOUR COUNTRY SMOKING AND VAPING SURVEY AND RECENT FINDINGS FROM THE 2016 AND 2018 WAVES

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SIGNIFICANCE: Globally, nicotine vaping products (NVPs) are increasing in popularity, and there is need to identify and understand the factors that affect the use of cigarettes and NVPs and transitions between them. This presentation describes the ITC conceptual model and recent findings from the ITC Four Country Smoking and Vaping Survey, a longitudinal cohort survey of adult smokers, vapers, and dual users across four countries—US, Canada, England, and Australia. **METHODS:** The 2016-2018 ITC Four Country Smoking and Vaping Surveys (Australia, Canada, England, US), is a cohort study of 13,000 adults, of whom 5,632 participated in both waves, 18 months apart. Eligible respondents were those who: smoked (cigarettes) exclusively, vaped (e-cigarettes) exclusively, or concurrently used both (dual users). **RESULTS:** The ITC conceptual model posits that the use of cigarettes, NVPs, and transitions between them, are affected by characteristics of the user, product, and regulatory environment. Because cigarettes and NVPs are substitutable products, regulations on cigarettes as well as on NVPs must be considered. 18-month transitions show: (1) less than half of exclusive smokers (28%) and exclusive vapers (34%) transitioned to another use pattern, (2) less than half of concurrent users (commonly referred to as “dual users”) transitioned, but the kind of transition varied, with predominant smokers (daily smoking & less-than-daily vaping) being 8.5 times more likely to transition to exclusive smoking than exclusive vaping, dual-daily users (daily smoking & vaping) being 2.3 times more likely to transition to exclusive smoking than exclusive vaping, and predominant vapers (less-than-daily smoking and daily vaping) being 1.7 times more likely to transition to exclusive vaping. These transitions demonstrate the greater attractiveness of cigarettes compared to NVPs, and highlight the importance of unpacking the broad category of “dual use.” **CONCLUSION:** International comparative research on products and regulatory approaches provide unique and valuable evidence for understanding the impact of products and regulations/policies.

FUNDING: Federal; State; Academic Institution

SYM13B

CHEMICAL CHARACTERIZATION OF E-LIQUIDS AND DEVICE CHARACTERISTICS OF E-CIGARETTES ACROSS FOUR COUNTRIES

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SIGNIFICANCE: Nicotine vaping products (NVPs) are increasing in popularity in many countries. The liquids used in NVPs typically comprise nicotine, humectants, and flavorings. Countries have taken different regulatory approaches to NVPs. The current study assessed whether differences in regulations across countries were associated with differences in the characteristics of NVPs themselves. This study presents findings from four countries—US, Canada, England, and Australia—on liquid concentrations of nicotine, nitrosamines, and flavoring agents, and device characteristics such as battery power, coil resistance, and user interface. **METHODS:** During April-September 2017, NVP liquids and refills were purchased at retail locations in and around Charleston, SC, USA; Waterloo, ON, Canada; Melbourne, VIC, Australia; and London, England, UK. Products were chosen from brands and styles most commonly reported by current NVP

users in the ITC Four Country Smoking and Vaping Survey. Where possible, products of the same brand/source were purchased in tobacco, menthol, and cherry flavors, and in variable nicotine concentrations. Across the 4 countries, 234 products (refill liquids, cartridges, disposable devices) were purchased. **RESULTS:** No single brand and/or manufacturer was dominant within or across countries. Consistent with the laws in Canada and Australia, none of the liquids purchased in those two countries (n=10 in Canada; n=15 in Australia) contained nicotine, whereas US liquids (n=54) had a mean nicotine concentration of 16.2 mg/ml and UK liquids (n=166) had a mean concentration of 12.5 mg/ml [F(3,241)=12.32, p<0.001]. Substantial differences were observed on levels of NNN, NNK, and NAT, with the US being higher than the UK. A qualitative analysis of flavoring compounds found that liquids and refills purchased in the UK contained far more identifiable additives than those in the other countries. US liquids contained the fewest number of flavorings. **CONCLUSION:** Regulatory environments appear to influence product composition, particularly with respect to nicotine and flavoring content, but not in the characteristics of the devices.

FUNDING: Federal

SYM13C

TRENDS IN VAPING AND JUUL USE AMONG YOUTH IN CANADA, UNITED STATES, AND ENGLAND: FINDINGS FROM THE ITC YOUTH TOBACCO & VAPING SURVEY

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SIGNIFICANCE: The vaping market is rapidly evolving, including a transition to higher nicotine salt-based products, such as JUUL. Concerns around the potential impact of these changes on youth vaping have led regulatory authorities to consider additional restrictions on vaping. There is a need for more detailed evidence on patterns of youth vaping, including measures of regular use and dependence, and the extent to which these outcomes are associated with the use of nicotine salt-based products. The current presentation will summarize population-level trends between 2017 and 2019, and examine differences between countries with distinct regulatory approaches: Canada (which introduced a new regulatory framework in 2018), England (which caps nicotine concentrations and restricts marketing), and the US. **METHODS:** Data were analyzed from Waves 1 to 3 of the ITC Youth Tobacco and Vaping Survey, conducted in 2017, 2018 and 2019, respectively. Online surveys were conducted with more than 35,000 youth aged 16 to 19 years, recruited from Nielsen consumer panels in Canada, England, and the US. Regression models were fitted to examine changes between countries over the three survey waves, using weighted data. **RESULTS:** From 2017 to 2018, significant increases in vaping were observed for daily/frequent vaping, past-week vaping, and past-month vaping among youth in Canada and the US compared to England (p<.01 for all). The use of JUUL was greatest among US and Canadian youth, although the most popular brands in all three countries were available with nicotine salt versions. Across all countries, approximately half of past-month vapers considered themselves ‘a little’ or ‘very addicted’ to vaping, while one-third of JUUL users considered JUUL to be ‘very’ or ‘extremely’ addictive. The results will include updated trends using 2019 data, with a focus on nicotine salt products and measures of dependence. **CONCLUSIONS:** Distinct patterns of youth vaping were observed between the three countries, with notable differences in England. Implications for vaping policies that are currently being considered by regulators in the US and Canada will be discussed.

FUNDING: Federal

SYM13D

THE EXPERIMENTAL TOBACCO MARKETPLACE: ESTIMATING THE EFFECTS OF POLICY

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BACKGROUND AND OBJECTIVES: Achieving the goal of tobacco control (i.e., to improve public health) requires estimates of the impact of new policies and products. Existing regulatory science methods can examine specific product features (e.g., pack-



aging). However, no current method can adequately estimate, prior to implementation, the effects of a new regulation or tobacco product on the patterns of consumption and substitution by current smokers across the various tobacco/nicotine products available in the more complex tobacco marketplace. This gap in both method and knowledge constitutes a significant challenge to prospective tobacco control and, without advancements, estimating the impact of new policies or products prior to implementation will be difficult. The goal of this series of studies has been to empirically assess the effects of regulatory changes on tobacco consumption among smokers. **METHOD:** Three studies have been completed in a within-subject design utilizing the Experimental Tobacco Marketplace (ETM), a novel method that places the mix of products, prices, and specific policies under experimental control to provide estimates of novel policies obtained under conditions that simulate "real-world" circumstances. **RESULTS:** Study 1 examined the substitutability between cigarettes and e-cigarettes as a function of the nicotine dose in the e-liquid and showed that substitutability increased as a function of e-liquid strength. The 24mg/mL displayed the greatest substitutability of all products. Study 2 examined the effects of cigarette taxes and e-liquid subsidies and showed that cigarette taxes decreased cigarettes purchases and increased e-liquid purchases. Interestingly, e-liquid subsidies had no effects on cigarette purchases and increased e-liquid purchases. Thus, taxes had more impact than comparable subsidies. Study 3 replicated Study 2 among dual users and e-cigarette users in an international context, showing results comparable to the lab-based ETM. **CONCLUSIONS:** The ETM provides a novel experimental context to explore the effects of policy and the substitutable relationship across various tobacco and nicotine products.

FUNDING: Federal

SYM13E

A COMPARISON OF RECENT TRENDS IN SMOKING PREVALENCE USING THE CANADA, ENGLAND, AND US SIMSMOKE MODELS: THE POTENTIAL ROLE OF NICOTINE VAPING PRODUCTS

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Background and Objectives: Nicotine Vaping Products (NVPs) have been called a "disruptive technology," where its primary impact is presumably on cigarette use. The purpose of this talk is to examine changes in cigarette smoking prevalence in Canada, England and US once NVP use began and compare to smoking prevalence that is predicted if NVP were not available. We will develop an indirect method for gauging NVP impacts on cigarette use and measure and compare NVPs impacts in three separate countries with different regulatory cigarettes and NVP policies. **Methods:** We use separate Canada, England and US SimSmoke models to control for long-term trends in smoking incorporating past tobacco control policies. The models are validated over the period before NVP use (i.e., the pre-vaping period), and projected forward over the period when NVP use began. Since the current models do not incorporate the use of NVPs, they provide "counterfactual" post-vaping predictions of smoking prevalence in the absence of NVPs. We compare the SimSmoke post-vaping predictions for each of the countries to country-specific, nationally-representative smoking prevalence estimates over the same post-vaping time period, i.e., the "actual" smoking prevalence with NVP use. The difference in trends serves as an indirect estimate of the impact of NVP on cigarette prevalence. In comparing the SimSmoke (no NVP) counterfactual smoking prevalence predictions to the actual smoking prevalence estimates, counterfactual estimates consistently below the actual prevalence estimates indicate that NVP use acts as a substitute for (i.e., displaces) smoking, whereas a counterfactual predictions consistently above actual smoking prevalence estimates indicate that NVPs are complements to (i.e., adds to) smoking. We consider differences by age and gender, focusing on ages where vaping is most prevalent. **Results:** Our preliminary results indicate that VNP use is associated with reduction in smoking prevalence of 10-25% in England, 8-20% in the US, and 3-15% in Canada. **Conclusions:** The variation in results countries reflects differences in policies towards cigarettes and NVPs in each of the three countries.

FUNDING: Federal

SYM14A

VISCERAL STATES CALL FOR VISCERAL MEASURES: ASSESSING CIGARETTE CRAVING WITH A SQUEEZE

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Self-report questionnaires are the principle measure for assessing cigarette craving, but they may not always capture the essence of a craving state. Motivational (visceral) states, such as drug craving, hunger, and sexual arousal are inherently nonverbal

experiences, and participants may have difficulty translating these inner experiences into symbolic systems (such as numbers and language) required for traditional "verbal" self-report rating scales. Further, in many studies (e.g., when heavy smokers are asked to refrain from smoking for several hours prior to the study), ceiling effects may interfere with a full rendering of craving during smoking cues using traditional verbal measures of craving with Likert scales. Many researchers agree that there is a need to expand the set of craving-related measures beyond traditional self-report rating scales. We evaluated the utility of a nonverbal "visceral" measure of cigarette craving (squeezing a handheld dynamometer) that overcomes issues associated with traditional self-report rating scales of craving and allows participants to express how they are feeling in a sensitive and nonverbal fashion. Nicotine-deprived daily smokers (N=202) underwent a cued (lit cigarette) cigarette-craving manipulation and recorded smoking urge in one of four conditions: (1) indicate urge only by squeezing a dynamometer, (2) report urge only using a traditional self-report rating scale (verbal measure), (3) report urge verbally and then indicate urge by squeezing, or (4) indicate urge by squeezing and then report urge verbally. As hypothesized, the squeeze measure detected increases in urge during cue exposure, correlated with verbal urge, and predicted subsequent smoking motivation as indexed by smoking latency. Order effects were not observed, indicating that the squeeze measure was predictive of smoking motivation regardless of whether it was administered before or after a verbal urge measure. Squeeze measures may be viable additions to the measurement toolkit for assessing urge. Findings will also be discussed in regard to the utility of the squeeze measure for assessing other visceral states, such as hunger and physical attraction.

FUNDING: Federal; State

SYM14B

THE IMPACT OF PLEASANT OLFACTORY CUES ON CIGARETTE CRAVINGS

Michael A. Sayette, PhD. University of Pittsburgh.

Cigarette craving plays a central role in smoking, which remains the leading preventable cause of death in the US. During moments of temptation the appeal of smoking rises, learned coping skills or "quit-smoking" messages may be ignored, and the habit persists. Unfortunately, research has struggled to develop treatments for craving relief. One approach showing promise is the strategic use of olfactory cues (OCs) to reduce cravings. This presentation describes research examining the possibility that exposure to pleasant OCs can reduce motivation to smoke. After an initial assessment of self-reported urge, nicotine-deprived smokers (n = 63, study 1, n = 232, study 2) evaluated the pleasantness of a series of OCs. Following OC administration, participants were exposed to smoking cues, a manipulation designed to generate a robust urge to smoke [urge = 83 (study 1) and 82 (study 2) on a 0-100 scale]. Next, participants were administered either their (a) most pleasant OC, (b) a control OC, or (c) either their least pleasant OC (study 1) or a tobacco-related OC (study 2), and again reported their urge to smoke. Results of both studies indicated that exposure to a pleasant OC significantly reduced reported urge to smoke, relative to the control and tobacco OCs. Moreover, in study 2 this effect persisted over the course of 5 min. Smokers with the most specific autobiographical memory systems also were most responsive to the craving-reducing effects of pleasant OCs. Although the mechanisms underlying the observed urge-reducing effect of olfactory stimuli are not altogether clear, results provide support for the viability of olfactory stimuli as an approach to craving reduction and highlight the utility of conducting interdisciplinary research spanning emotion, cognition, and olfaction to understand and modify smoking motivation.

FUNDING: Federal

SYM14C

CIGARETTE CRAVING AFTER PASSIVE EXPOSURE TO E-CIGARETTES ACROSS THE 1ST, 2ND, 3RD, AND 4TH GENERATION DEVICES

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Electronic nicotine delivery systems (ENDS or e-cigarettes) share many salient features of combustible smoking, so it is possible their use could affect observers. Thus, we examined whether passive exposure to e-cigarette vaping represents a Pavlovian cue to elicit cigarette and e-cigarette cravings in observers. Five studies (2013-2018) were conducted to compare young adult smokers' responses to a neutral water cue, an active cigarette cue, and ENDS cues across four generations of devices, including cigalikes, vape pens, mods, mods with a feminine appearance, and JUUL. In one study, the cue salience of ENDS' expired aerosol cloud was examined by varying the levels



of the humectant vegetable glycerin (VG) in the e-liquid. Across all studies, cues were delivered by a trained study confederate portraying the role of being a participant in a laboratory paradigm disguised as investigating social interactions. A total of 345 smokers were tested [mean age 26.9 ±4.6 yrs (SD); 46% female; 9.0±4.9 cigarettes/daily; 3.9±2.2 FTND; 62% with past year e-cigarette use]. Results showed that relative to the water cue, all ENDS product exposures significantly increased smoking desire and urge [$\chi^2(2)=152.7, ps<.001$], with no differences across products and with responses of a similar magnitude as that of the cigarette cue ($ps=0.387$). In addition, ENDS exposures increased desire for an e-cigarette to a greater extent than the cigarette cue ($p=0.001$). Larger (vs. smaller) aerosol clouds augmented cue reactivity [smoking desire: cue x time, $\beta(se)=2.93(1.04), p<.01$]. Including smoking and e-cigarette history as covariates did not alter any of these results. Participants with higher FTND scores and prior use of ENDS showed more craving sensitivity to the ENDS cues [$\chi^2(1)=4.15, ps<.042$]. In sum, passive exposure across four generations of ENDS produces increase in desire to smoke and vape in observers, and young adults with more nicotine dependence and prior ENDS use are particularly sensitive to ENDS cues. As the popularity of these devices rises and new products emerge, continued understanding of their role as Pavlovian cues to smoke will be of increasing importance.

FUNDING: Federal

SYM14D

LOOKING AHEAD: THE POTENTIAL OF COMPUTER-MEDIATED REALITY FOR THE ASSESSMENT AND MANIPULATION OF CRAVING

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With few exceptions, both the assessment of cue-provoked craving and its attenuation via extinction-based approaches have been limited by the four walls of the laboratory or clinic, which in turn has limited the ecological validity of assessment, and the generalizability of cue-exposure treatments. Notably, Pavlovian extinction does not generalize well beyond the original extinction context. This "renewal effect" is posited to account for the disappointing efficacy of smoking cessation interventions designed to extinguish craving responses to smoking-related cues. To date, it has not been feasible to conduct extinction trials in all of a smoker's naturalistic smoking contexts, as required to overcome the renewal effect. However, recent advances in Computer-Mediated Reality (CMR), which encompasses virtual reality (VR), augmented reality (AR), and mixed reality (MR), offer new opportunities to break through the clinic walls. VR is best known and has already been utilized in cue-reactivity and extinction paradigms, but it is costly, has realism problems, and does not incorporate the smoker's true natural environment. In contrast, AR superimposes realistic digital objects (e.g., smoking cues) onto real-world scenes as viewed in real time through a smartphone, tablet, or headset. Whereas AR has been adopted for retail, entertainment, and professional training uses, it also has potential as a novel, mobile, and efficacious modality for assessing and attenuating cravings by presenting stimuli to smokers in their natural environments. To date, the limited psychological literature on AR has mainly focused on the treatment of simple phobias. However, we posit that it has significant potential as an adjuvant treatment for addictive disorders, including tobacco dependence. In this talk, we will describe AR, contrast it with VR, review the theoretical foundation for its relevance to cue-exposure therapies, provide examples, and identify the most timely theoretical, practical, and implementation-based research questions. Looking further ahead, MR would allow for actual interaction between a smoker and digitally-created stimuli.

FUNDING: Federal

SYM15A

PREVALENCE OF TOBACCO USE AMONG SEXUAL AND GENDER MINORITY YOUTH

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Purpose:Sexual and gender minority (SGM) adults are at higher risk for tobacco use than their cisgender, heterosexual peers. However, research examining tobacco use among SGM youth is insufficient. This study estimated prevalence of ever and current past 30-day tobacco use across measures of sexual orientation and transgender identity among youth ages 14-17. Methods:A cross-sectional analysis using Wave 4 data from the youth Population Assessment of Tobacco and Health Study was conducted (N=9,916). Multinomial logistic regression models assessed the relative odds of ever and current tobacco use, adjusting for demographic (sex, age, race, census region)

and psychosocial (self-perception of mental health status and internalizing/externalizing behaviors) covariates. Results:Nearly 10% of youth identified as something other than heterosexual, while 16.3% were attracted to only the same sex, both sexes, or had no attraction. Youth with no attraction had lower relative odds of ever (aOR: .47; 95% CI: .35-.62) and current tobacco use (aOR: .46; .27-.75), and youth attracted to both sexes had higher relative odds of ever (aOR: 1.79; 1.43-2.24) and current tobacco use (aOR: 1.50; 1.09-2.05) compared to youth attracted to only the opposite sex. More bisexual youth had ever used tobacco compared to their heterosexual peers (45.2% vs. 27.8%, $p<.001$). Bisexual girls had higher relative odds (aOR: 2.34; 1.89-2.90) of ever use. More bisexual youth reported current tobacco use than heterosexual youth (17.7% vs. 9.9%, $p<.001$). Bisexual youth also had higher relative odds of current use (aOR: 1.65; 1.29-2.10). The most common currently used product was e-cigarettes (6.6%) which was disproportionately concentrated among bisexuals (10.1%; heterosexual=5.9%, homosexual=4.0%, something else=5.2%, $p<.05$). Just over 1% of youth identified as transgender; no significant differences in ever or current use were detected according to transgender identity.Conclusion: Our findings indicate higher rates of tobacco use among sexual minority youth, especially among bisexual girls. Approaches to prevention tailored for sexual minorities, with specific attention to bisexual girls, are needed.

FUNDING: Unfunded

SYM15B

TOBACCO PRODUCT USE AND SUSCEPTIBILITY IN SEXUAL MINORITY VERSUS HETEROSEXUAL ADOLESCENTS

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Background: Sexual minority adults are more likely to use tobacco products than heterosexual adults. In a sample of adolescents, we examined differences in tobacco product use and susceptibility to use by sexual minority status.Methods: Data were collected in February 2019 via a Qualtrics adolescent research panel. Respondents reported lifetime tobacco use, peer e-cigarette use, susceptibility to e-cigarette use, sexual identity (coded as straight/heterosexual vs lesbian, gay, or bisexual [LGB]), and demographic characteristics. Associations for sexual identity with tobacco use and use susceptibility were evaluated using chi-square tests and multivariable logistic regressions adjusting for age, gender, race/ethnicity, maternal education, and peer use.Results: The sample (n=951), with a mean age of 15 years (SD=1.4), was 88.2% female, 40.3% non-Hispanic White, and 24% LGB. LGB adolescents were more likely than straight adolescents to report ever combustible cigarette use (27.6% vs. 15.6%, $p<0.001$) and ever e-cigarette use (40.5% vs. 27.1%, $p<0.001$). Among non-users of e-cigarettes, LGB adolescents were more likely than straight adolescents to be susceptible to initiating use (42.5% vs. 27.1%, $p<0.001$). In adjusted models, for LGB relative to straight adolescents, the odds of lifetime combustible cigarette use were 2 times greater (odds ratio [OR]=2.00; 95% confidence interval [CI]: 1.35, 2.98); the odds of e-cigarette use were 47% greater (OR=1.47; 95% CI: 1.00-2.16); and among non-users, the odds of e-cigarette susceptibility were 76% greater (OR=1.76; 95% CI: 1.11-1.78).Conclusion: Relative to peers identifying as straight, LGB adolescents were more likely to report lifetime combustible cigarette and e-cigarette use, and non-user LGB adolescents were more likely to be susceptible to initiating e-cigarette use.

FUNDING: State; Academic Institution

SYM15C

DIFFERENCES IN TOBACCO PRODUCT USE BY SEXUAL ORIENTATION AND VIOLENCE FACTORS AMONG U.S. YOUTH

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Sexual minority youth report greater use of both cigarettes and electronic cigarettes (e-cigarettes) than heterosexual youth, and sexual minority youth are also more likely to be exposed to violence factors that increase substance use risk (e.g., bullying, fighting). Research suggests poly-tobacco use patterns are associated with worse health and greater likelihood of dependence than exclusive product use, thus there is a need to identify correlates that can inform tobacco interventions. We hypothesized that compared to heterosexuals, sexual minority youth would be more likely to report exclusive and poly-tobacco use and that exposure to violence factors would attenuate these associations.Data from 27,308 U.S.-based high-school youth (89% heterosexual with other-sex partners, 11% sexual minority youth; ages 12-18 years) were analyzed from the Centers for Disease Control's Youth Risk Factor Surveillance System from 2015 and 2017. Weighted, sex-stratified, and adjusted log-Poisson models examined differ-



ences in exclusive combustible tobacco use (cigarettes, cigars), exclusive e-cigarette use, and poly-tobacco use by sexual orientation (heterosexual with other-sex partners [reference], heterosexual with same sex partners, bisexual, gay/lesbian). Then, models were adjusted for past-year experiences of physical fighting, bullying, attempting suicide, and physical and sexual dating violence. Compared to heterosexual girls with other-sex partners, sexual minority girls (including heterosexual with same-sex partners, mostly heterosexual, bisexual, and lesbian girls) were more likely to report exclusive combustible, exclusive e-cigarette, or poly-tobacco use. When adjusting for violence factors, most tobacco use associations were partially attenuated for all sexual minority girls, and completely attenuated for exclusive e-cigarette use among all sexual minority girls. These patterns of attenuation among sexual minority girls indicate more research is needed on poly-tobacco use correlates for this population. Tobacco prevention and cessation interventions for sexual minority youth should address the risks of poly-tobacco use.

FUNDING: Federal; Nonprofit grant funding entity; Other

SYM15D

FAMILY REJECTION AND CIGARETTE SMOKING AMONG SEXUAL AND GENDER MINORITY YOUTH

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Significance: Sexual and gender minority (SGM) adolescents are more likely than their heterosexual and cisgender peers to smoke cigarettes. This study sought to examine to whether family rejection due to one's sexual or gender identity was associated with cigarette smoking after statistically adjusting for sexual orientation identity, gender identity, sex assigned at birth, outness to family, race/ethnicity, geographical region, and SGM-specific violence. **Methods:** A sample of 11,192 SGM youth completed a one-time cross-sectional online survey. Participants ranged in age from 13 to 17 (M= 15.6). The majority of the sample identified as non-Hispanic White (65%) and cisgender (65.2%), and were assigned female at birth (75.4%). Participants self-reported their sexual orientation and gender identity, outness to parents, current cigarette use, and completed measures of SGM-specific family rejection and violence. **Results:** Approximately 7% of the sample currently smoked cigarettes. In multivariable logistic regression analyses, family rejection was associated with cigarette smoking after adjusting for covariates (AOR=1.19, 95% CI: 1.09, 1.29). Experiencing SGM-specific violence was also associated with smoking in multivariable models (AOR=1.15, 95% CI: 1.12, 1.17). Further, transgender boys (AOR=1.93, 95% CI: 1.48, 2.52) had increased odds of smoking compared to cisgender girls. Youth who were out to their parents about their gender identity (AOR=1.34, 95% CI: 1.11, 1.62) and their sexual orientation identity (AOR=1.26, 95% CI: 1.03, 1.54) had increased odds of smoking. **Conclusions:** Our findings underscore the importance of attending to the role of families alongside other minority stressors in tobacco prevention and smoking cessation efforts with SGM youth.

FUNDING: Unfunded

SYM15E

MEASURING MOMENTARY MINORITY STRESS AMONG SEXUAL AND GENDER MINORITY YOUTH WHO USE NICOTINE: AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY

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Sexual and gender minority youth (SGMY; e.g., lesbian, gay, bisexual, and transgender) are more likely to use nicotine compared to their heterosexual and cisgender peers. The minority stress model posits these disparities are partly due to unique stress ("minority stress") specific to SGMY's stigmatized identities. But evidence supporting this theory relies almost exclusively on minority stress measures that retrospectively examine lifetime or recent minority stress; none assess minority stress among SGMY as it occurs in real-time in daily life. Understanding the frequency of minority stress in real-time and how it relates to nicotine use is needed to test the minority stress model and inform intervention work. This study piloted a 30-day ecological momentary assessment (EMA) protocol to measure minority stress among SGMY nicotine users. Participants (N=66; 15-19 years, M=18.14) were recruited from the community (83.3% White) and identified their gender as female (50%), male (29%), and transgender (21%), and most identified their sexual orientation as bisexual (58%). Using EMA, they completed 5 daily random surveys between 9am and 11:59pm for 30 days (response rate=59%). Nine items relating to common minority stressors were developed from focus groups with SGMY. If stressors were endorsed in the EMA assessments, SGMY selected from a list

of possible identities they attributed to their experience. Participants completed 4,652 EMA surveys, reported 971 minority stressors, and had 2,406 instances of nicotine use over the 30-day EMA period. Stressors were attributed to sexual orientation (221), gender identity (241), and gender expression (261). Vaping (1,828), cigarette smoking (426), and e-cigarette use (118) were the most common forms of nicotine use. Findings support the utility of this newly developed measure for capturing minority stress in real-time in daily life. SGMY experienced many minority stressors and reported high frequency of nicotine use. A direct test of how minority stress relates to nicotine use will be presented, and implications for the minority stress model and nicotine use among SGMY will be discussed.

FUNDING: Federal

SYM16E

I READ THE TEXT ONLY SO I DONT HAVE TO LOOK AT THE PICTURE- FEEDBACK FROM YOUTH ON WATERPIPE TOBACCO SMOKING PRODUCT HEALTH WARNING LABELS

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Background: Waterpipe (WP) tobacco smoking has become number 1 tobacco use method in Lebanon. A potential policy solution to curb WP smoking might be in the application of health warning labels (HWLs) on WP tobacco and products. This study aimed to get feedback from WP smokers and nonsmokers (age 18-34) in Lebanon to adapt a set of 13 pictorial (text+image) HWLs developed through an international expert Delphi study, and centered on five major themes (health risks, nicotine dependence, harm to others, WP-specific harm, WP harm compared to cigarette) to the Lebanese context. **Methods:** Four mixed-gender focus groups (FGs) discussions with WP smokers and 5 with nonsmokers were conducted (8-10/FGD, n= 77). All FGDs were recorded, transcribed and thematically analyzed following elements of the Message Impact Framework (attention, reactions, social interactions, perceived effectiveness), and improvement. **Results:** For attention, participants noted that HWLs were "revolting", "powerful" and hold a "shock value" (e.g. HWLs on oral cancer and babies). However, some images were "very dark" and of "low resolution". Regarding reactions, some HWLs were not believable, and participants opted to remove them from the HWL lineup and in other cases looked away (e.g. addiction HWL). For perceived effectiveness, participants noted that the HWLs made smoking less attractive, and will encourage people to stop smoking (e.g. HWL on oral cancer). Yet, participants did not appreciate the long text "too much text." For social interactions, some participants discussed the HWLs with each other and noted sharing them with their peers, while others said that these HWLs would be a "social joke". Suggested improvements were to remove the word "can" ("نستطيع" in Arabic), to emphasize the message more, modify the text to the Lebanese dialect, and make it more "concise" and use slang catch phrases to maximize smokers' attention. Other suggestions were to use "positive message" suggesting an alternative behavior to WP smoking (e.g. exercise). **Conclusion:** Both WP smokers and nonsmokers provided important suggestions for improving the HWLs and recommended excluding few HWLs (e.g. HWLs on toxins and wrinkles).

FUNDING: Federal; Academic Institution

SYM16F

RESULTS OF A SINGLE ARM PILOT STUDY OF A MOBILE MESSAGING INTERVENTION FOR HOOKAH TOBACCO CESSATION IN YOUNG ADULTS

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Significance: Hookah tobacco use is common among young adults. Unlike cigarette smoking, there is limited evidence on mobile (i.e., mHealth) interventions to promote cessation. This pilot study tested the feasibility and preliminary efficacy of mobile multimedia messaging for cessation in young adult hookah smokers. **Methods:** Hookah smokers (N=20) aged 18-30 years received a six-week mHealth multimedia messaging intervention. Message scheduling (2 days/week x 6 weeks) was based on the literature. Content was developed iteratively by the study team, focused on health harms and addictiveness of hookah, and was individually tailored by baseline hookah use frequency, risk beliefs, and responses to interactive text messages to maximize impact. Engagement was assessed during the intervention, and efficacy was measured by risk perceptions, risk beliefs, and risk appraisals, motivation to quit, and behavior change immediately post-intervention. **Results:** Participants responded on average to 11.5 (SD



0.69) out of 12 total text message prompts, endorsed high message receptivity ($M=6.1$, $SD=0.93$, range 1-7), and reported the messages were helpful ($M=8.5$, $SD=1.5$, range 1-10). There were significant ($p < .05$) increases in risk perceptions (d 's = 0.22 to 0.88), risk appraisals ($d = 0.49$), risk beliefs ($d = 1.11$), and motivation to quit ($d = 0.97$) post intervention. Half of participants reported reducing frequency of hookah use (20%) or quit completely (30%) by end of treatment. **Conclusions:** Results support the feasibility and preliminary efficacy of a mHealth messaging intervention about risks of hookah tobacco. Rigorously examining the efficacy of this promising intervention is warranted.

FUNDING: Federal

SYM16A

PERCEIVED EFFECTIVENESS AND REACTANCE IN RESPONSE TO HEALTH WARNINGS FOR WATERPIPE TOBACCO

Megan E. Roberts, PhD. Ohio State University.

Background: Warning labels are an effective way to increase awareness of the harmful health effects associated with tobacco. The Food and Drug Administration (FDA) requires waterpipe (WP) tobacco packages to have a warning label with the mandated nicotine addiction message. The aim of this study was to examine this warning as well as others that might be more effective for reducing WP smoking among young adults. Methods: An online survey was administered to a convenience sample ($n=190$) of young adults. Participants viewed 5 (out of 12 total) randomly selected and ordered warning messages. The effectiveness of each message was assessed with questions measuring the level of health concern, unpleasantness, and smoking discouragement the message evoked; reactance was assessed with questions measuring how manipulating, annoying, and overblown participants perceived the message to be. The best messages had high effectiveness and low reactance scores (1-5 scale). Survey results were supplemented by 3 focus groups of WP users ($n=14$) who discussed the perceived effectiveness and reactance of each warning. The final message was tested in a random sample of university students ($n=376$). Results: The FDA's mandated nicotine addiction message was the least effective of the 12 tested ($M=3.46$). For effectiveness, the top 2 messages were: "hookah smoke contains poisons that can cause lung, bladder, and oral cancers" ($M=4.35$) and "hookah smoking can cause mouth and lung cancer" ($M=4.26$). For reactance, the top 2 messages were: "hookah smoking can cause mouth and lung cancer" ($M=2.15$) and "hookah smoking increases the risk of leukemia and other cancers" ($M=2.24$). Focus group participants elaborated more on each warning message and allowed us to select the final message "hookah smoke contains poisons that can cause lung and oral cancers." This message achieved high effectiveness ($M=4.49$) and low reactance ($M=2.12$) scores when tested in the random sample of students. Conclusions: Through a combination of quantitative and qualitative research methods, we have selected a warning message that will be further tested for its ability to reduce WP smoking among young adults.

FUNDING: Federal

SYM16B

REACTIONS TO WATERPIPE TOBACCO TEXT WARNINGS AMONG WATERPIPE TOBACCO SMOKERS AND SUSCEPTIBLE NON-SMOKERS

Isaac M. Lipkus, PhD. Duke University School of Nursing.

Background: Text warnings are key to informing the public of the health effects of waterpipe tobacco. However, which warnings are most effective at influencing perceived health risks and desire to smoke waterpipe remains underexplored. We examined reactions of young adult waterpipe tobacco smokers and susceptible non-smokers to text warnings in four domains: long- and short-term health effects, toxicants, and addiction. Methods: This online study included adults ages 18-30 who smoked waterpipe ($N=325$) and those susceptible ($N=340$). Participants were randomized to view three of four warnings in one of the four aforementioned domains. The main outcomes were: 1) extent warning made participants concerned about health risks (1=Not at all to 7=A great deal); and 2) perceived effectiveness of warning to reduce participants' desire to smoke waterpipe (1=Not at all to 7=Extremely). Secondary outcomes, using 7-point scales, included perceived credibility, personal relevance, and negative emotional reactions (e.g., fear, anxiety) to warnings. Results: Among smokers, warnings about long-term effects (e.g., lung cancer) were most effective in reducing desire to smoke (Mean [M]=4.40) while producing the highest level of health concerns ($M=5.10$). Among susceptibles, warnings about toxicants (e.g., carbon monoxide) and long-term effects were equally effective in reducing desire to smoke (M 's=5.67 and 5.80, respectively) while producing the highest levels of health concerns (M 's=5.22 and 5.55, respectively). Both groups believed warnings across domains were credible (M 's=4.61 - 5.73), although they did

not elicit in either group very high negative emotions (M 's=3.14 - 4.63) nor viewed as highly personally relevant (M 's=2.96 - 4.27). Conclusions: Text warnings about long-term health effects were most effective at reducing desire to smoke and raising health concerns among smokers and more so among susceptible non-smokers. Despite high perceived credibility, text warnings did not elicit strong negative emotions, a correlate of smoking behavior, nor found highly personally relevant. Future work will test whether addition of graphic warnings increases text warning efficacy.

FUNDING: Federal

SYM16C

AN EXPERIMENTAL STUDY OF WATERPIPE WARNING STATEMENTS AMONG A NATIONAL SAMPLE OF U.S. YOUNG ADULTS

Erin L. Sutfin, PhD. Wake Forest School of Medicine.

Background: Waterpipe tobacco smoking (WTS) by young adults remains high. The FDA now requires a nicotine text warning on waterpipe packaging and advertising. The goal of this study was to test five warning statements, including the mandated one, on young adults' thinking about the risks of WTS and discouragement from WTS. Methods: We conducted a between subjects experiment in a national telephone survey of 1,152 young adults ages 18-29. Participants were randomly assigned to hear one of the following: (1) Warning: Hookah smoke contains nicotine. Nicotine is an addictive chemical (mandated warning); (2) Warning: Hookah smoke contains more carbon monoxide than cigarette smoke; (3) Warning: Hookah smoking causes cancer; (4) Warning: The water in a hookah does not filter out the toxic chemicals; or (5) Warning: One hour of hookah smoking is about the same amount of smoke as 100 cigarettes. Participants reported how much the warning made them think about WTS risks and discouraged them from WTS, both on a 4-point scale. Results: The sample was 46.8% female, 57.8% White, 20.2% African American, and 24.1% Hispanic, with a mean age of 23.2 years ($SD=3.6$). Forty-three percent had ever smoked tobacco in a waterpipe. The mandated warning was the least discouraging ($M=2.85$, $SD=1.19$), while the "100 cigarettes" warning was the most discouraging ($M=3.56$, $SD=0.84$), $F=14.13$, $p<0.001$. The mandated warning led to less thinking about WTS risks ($M=2.85$, $SD=1.13$), while the "100 cigarettes" warning resulted in the greatest thinking about risks ($M=3.62$, $SD=0.780$), $F=19.2$, $p<.0001$. The "100 cigarettes" warning was more discouraging than warnings #3 and #4 and resulted in more thinking about the risks than either warning #3 or #4. Similar results emerged for the sub-sample of ever users. Conclusion: The mandated nicotine warning resulted in the lowest levels of thinking about risks and discouragement from WTS, suggesting limited impact. A warning focused on comparing WTS smoke inhalation to an equivalent amount of cigarettes shows promise. The FDA should consider requiring additional WTS warnings to cover a broad range of health effects, and possibly comparisons to cigarettes.

FUNDING: Federal

SYM16D

VISUAL ATTENTION TO HEALTH WARNING LABEL PLACEMENT ON WATERPIPE DEVICES

Elizabeth G. Klein, PhD MPH. Ohio State University, College of Public Health.

Background: The Food and Drug Administration (FDA) requires only that waterpipe (WP) tobacco packages to have a warning label; there are no current requirements to place warning labels on the WP device itself. Most young adults smoke WP in a café environment where the WP is brought to them, already prepared for smoking, preempting exposure to the WP warning label. Given the diversity of WP devices on the market, the aim of this study was to use best visual communication design practices within the constraints of FDA regulation to study attention to warning label placement on standard locations on common types of WP devices. Methods: A convenience sample of ever WP users was recruited ($n=37$) to complete an eye tracking study where all participants viewed a randomized sequence of 96 waterpipe images: 2 warning message conditions (text only and text/graphic) x 4 WPs (for home and commercial use) x 4 photos (cropped and full-size) x 3 placements (base, hose, stem). During a standardized 5-second viewing interval, eye tracking software captured the dwell time in milliseconds on areas of interest (AOIs) standardized on the base, hose, and stem. For analysis, dwell time for all placement locations AOIs were summed. T-tests compared the total dwell time on WPs where a warning label was present or absent. Results: Participants spent approximately 0.46 seconds viewing the warning label placement areas (total viewing time for base, stem, hose) compared to 0.12 seconds viewing those same areas on an unlabeled pipe ($p < 0.001$). These differences were observed despite the fact that there were no significant differences between observed dwell time across the 4 WP devices for labeled (range: 415-515 ms) and unlabeled images (range: 110-141 ms). Conclusions:



Placement of a health warning label on the base, stem, or hose of a WP has potential to attract attention of young adult WP users. These findings provide important empirical evidence needed to consider expansion of WP warning placement to better attract user's attention for the increased protection of public health.

FUNDING: Federal

SYM17A

A SNAPSHOT OF COUNTRY-LEVEL POLICIES THAT REGULATE NON-COMBUSTIBLE NICOTINE DELIVERY SYSTEMS INCLUDING E-CIGARETTES AND HEATED TOBACCO PRODUCTS

Ryan David Kennedy, PhD. Department of Health, Behavior & Society, Johns Hopkins Bloomberg School of Public Health.

Significance: The Institute for Global Tobacco Control conducts ongoing monitoring of country-level policies that regulate alternative nicotine delivery systems (ANDS) including e-cigarettes and heated tobacco products (HTP). It is valuable for jurisdictions considering ANDS regulations to understand how these products are being regulated country-to-country. **Methods:** National ANDS regulations were identified through ongoing media monitoring and twice/year direct contact with representatives of Ministries of Health and/or tobacco control experts in approximately 130 countries. Copies of written policies/laws regulating any aspect of ANDS were reviewed to identify which products are regulated, and which policy domains were being addressed. Policy summaries and domain classifications are verified by in-country experts including Ministry of Health staff. **Results:** As of July 2019, the scan has identified 99 countries that have a national policy regulating some aspect of ANDS. The percentage of member states that regulate e-cigarettes and HTP differs by WHO Region. The percentage of member states regulating e-cigarettes is: 13% (n=6) of African Region (AFRO), 46% (n=10) of Eastern Mediterranean Region (EMRO), 76% (n=40) of European Region (EURO), 51% (n=18) of the Region of the Americas (PAHO), 55% (n=6) of South-East Asia Region (SEARO), and 48% (n=27) of Western Pacific Region (WPRO). HTP products are regulated in 7% (n=3) of AFRO, 5% (n=1) of EMRO, 45% (n=24) of EURO, 9% (n=3) of PAHO, 36% (n=4) of SEARO, & 19% (n=5) of WPRO. Considering the 99 countries regulating ANDS, common regulatory domains include marketing restrictions (67%, n=67), including ANDS in clean air laws, (52%, n=51), applying minimum age of purchase (36%, n=36), and taxes (13%, n=13). **Conclusion:** Globally, more countries have policies regulating e-cigarettes compared to HTP. The region with the greatest proportion of countries regulating ANDS is Europe, explained in part by the European Union's Tobacco Product Directive which obligates the 28 member countries to enact laws to regulate ANDS. Regulatory approaches differs greatly; few countries are applying taxes to ANDS.

FUNDING: Nonprofit grant funding entity

SYM17B

ENGLAND'S APPROACH TO E-CIGARETTES AND HEATED TOBACCO PRODUCTS: MANAGING RISKS AND BENEFITS

Ann McNeill, PhD. King's College London.

Significance: England is often described as an outlier in its approach to e-cigarettes (EC) but its regulatory framework is based on the European Union Tobacco Products Directive (TPD). England also has one of the most comprehensive tobacco control strategies worldwide, and considers that additional harm reduction strategies can make contributions to reducing smoking rates. Heated Tobacco Products (HTPs) are regulated as novel tobacco products. The impact is monitored through annual reports by evidence reviews commissioned by Public Health England (PHE). England recently pledged to become smoke-free by 2030. **Methods:** To compare and discuss the impact of: (1) EC, HTP and combustible tobacco regulations in England; and (2) prevalence and attitudes towards use of the 3 product categories, drawing from different data sources summarized in PHE reports. **Results:** Cigarettes are comprehensively regulated in England, and the country has led the 'European Tobacco Control Scale' (monitors tobacco control policies across Europe) since 2007. HTPs are regulated similarly to combustible tobacco, but with some exceptions, such as having a separate taxation structure. Sales of ECs are banned to minors, similar to tobacco, but they are otherwise regulated according to the TPD; domestic advertising is allowed, but a code governs flagrant promotion. Government communications promote the use of ECs for smoking cessation but emphasize they are not for young people or non-smokers. England has reached the lowest smoking prevalence ever, now at 14.4% (2019), with 6.3% EC use prevalence. HTP use is very low. Smoking among 11-15 year olds has plateaued around 3% in recent years, but regular EC use among never smokers remains very low. However, misperceptions on relative risks abound. **Conclusion:** England's strategy appears to be driving smoking rates down, whilst encouraging less harmful product

substitution. To meet the 2030 pledge, England will need to continue to manage risks and benefits of new nicotine products requiring nimble regulatory responsiveness, so continued surveillance is required.

FUNDING: Unfunded

SYM17C

THE PLACE OF NON-COMBUSTIBLE ALTERNATIVE NICOTINE DELIVERY SYSTEMS (ANDS) AND DEVELOPMENTS IN REGULATION IN AN ENDGAME CONTEXT: THE NEW ZEALAND EXPERIENCE

Richard Edwards, MB BChir MPH MD. University of Otago, Wellington.

In 2011 The New Zealand (NZ) Government adopted the Smokefree Aotearoa goal to reduce smoking prevalence to minimal levels by 2025. Since then, tobacco control interventions implemented have been modest, and reductions in smoking prevalence inadequate, particularly for Maori, the indigenous population of NZ. Nicotine-containing e-cigarettes and e-liquids (ECs) were prohibited for sale in NZ until 2017, but could be bought online and imported for personal use. In March 2017 the Government announced its intent to relax this policy. Retail availability progressively increased and shops were not prosecuted for selling these products. Following a March 2018 Court ruling, it has also been legal to sell 'heat not burn' products and other non-combusted tobacco products. The legal and regulatory status of ECs has been in limbo recently due to lack of clarity as to whether they are tobacco products. The practical effect is that there is minimal regulation, and ECs are now sold in various retail locations, there is increasing advertising and promotion of ECs, and no regulation of product standards, flavours, packaging etc. In November 2018, a new Government announced the intention to introduce EC regulations. Proposals were set out in a Cabinet paper which included tightening controls in areas such as advertising, minimum age of purchase, and where vaping is allowed whilst allowing sale in most retail locations and introducing minimal restrictions on flavours and product standards. Consultation is likely to occur towards the end of 2019, and implementation in 2020. The Government also announced it would develop a comprehensive strategy and action plan setting out how Smokefree 2025 Aotearoa will be achieved. There is active debate in NZ about the potential for ANDS to contribute to achieving Smokefree 2025, compared to, or in conjunction with, other tobacco control interventions. This presentation will describe and discuss the latest developments from NZ, discuss smoker and public support for different approaches, and outline the possible future trajectories of ANDS and tobacco product regulation as the 2025 deadline approaches.

FUNDING: Unfunded

SYM17D

THE USA'S UNIQUE REGULATORY FRAMEWORK FOR ANDS: HELP OR HINDRANCE FOR HARM REDUCTION & TOBACCO CONTROL?

Eric Lindblom, JD Law. O'Neill Inst. for Nat'l & Global Health Law.

Unless a new or substantially changed tobacco product, including non-combustible alternative (electronic) nicotine delivery systems (ANDS), closely resembles a tobacco product that was on the U.S. market on February 15, 2007, it may not legally enter or stay on the U.S. market without first obtaining a permissive order from the U.S. Food and Drug Administration (FDA). Accordingly, all e-cigarettes on the U.S. market today are illegal products. They have been able to be marketed and sold only because FDA has chosen not to enforce against them. Thanks to a U.S. federal court ruling, however, manufacturers must submit an application to get an order from FDA to make their e-cigarettes legal products by May 12, 2020 or face being pulled off the market. Even if an application is submitted on time, the e-cigarette will still face being pulled off the market unless the application convinces FDA that allowing the e-cigarette's marketing and sale will be "appropriate for the protection of the public health" (i.e., will likely produce a net reduction in tobacco-related harms to the population as a whole with relatively little or no risk of producing a negative public health impact, instead). Meanwhile, IQOS, the Philip Morris inhalable heated tobacco product, has already received an FDA order allowing its sale in the USA. This presentation will discuss how the entry of IQOS has affected the U.S. market for ANDS and other tobacco products; the impacts of any recent or pending FDA or other major tobacco control actions (e.g., the court-mandated FDA graphic health warning rule and the possible increase of the federal minimum age from 18 to 21); how the May 2020 e-cigarette applications deadline and related FDA decision



making is likely to affect the ANDS market; and what FDA is likely (and unlikely) to do in the near future to affect either ANDS-based harm reduction or tobacco control in general, including possible impacts from the November 2020 elections.

FUNDING: Unfunded

SYM17E

TRANSITIONS IN SMOKING AND VAPING OVER 18 MONTHS. LONGITUDINAL FINDINGS FROM THE ITC FOUR COUNTRY SMOKING AND VAPING COHORT SURVEY

Shannon Gravely, PhD. University of Waterloo.

Significance: This study describes transition patterns between smoking, vaping, cessation, and relapse over an 18-month period, and examined if reasons for using e-cigarettes differed among dual (concurrent) users. **Methods:** Data are from the 2016-2018 ITC Four Country Smoking and Vaping Surveys (Australia, Canada, England, US), a cohort study of 5632 adults who smoked (cigarettes) exclusively, vaped (e-cigarettes) exclusively, or concurrently used both. Concurrent users were: predominant smokers (smoked daily, vaped less than daily), dual-daily users, predominant vapers (vaped daily, smoked less than daily), or non-daily users (used both less than daily). **Results:** Between 2016 and 2018: [1] exclusive smokers (n=3409): 72.1% did not change, 17.1% transitioned to vaping (of which 83% were dual users), and 10.8% quit smoking; [2] exclusive vapers (n=351): 65.6% did not change, 3.9% became exclusive smokers, 9.3% became dual users, and 21.2% quit vaping; [3] concurrent users (n=1163): predominant smokers (n=598): 28.3% did not change, 40.1% became exclusive smokers, 16.4% became dual-daily users, 3.0% became predominant vapers, 3.1% became concurrent non-daily users, 4.7% became exclusive vapers, and 4.3% quit both; dual-daily users (n=322): 39.5% did not change, 19.4% relapsed back to smoking only, 20.4% became predominant vapers, 8.5% switched to exclusive vaping, and 2.0% quit both; concurrent non-daily users (n=148): 41.2% did not change, 12.4% became exclusive smokers, 8.9% became predominant smokers, 7.4% became dual-daily users, 9.0% became predominant vapers, 9.7% became exclusive vapers, and 11.5% quit both; predominant vapers (n=95): 29.9% did not change, 9.4% relapsed back to smoking only, 15.8% became predominant smokers, 15.0% became dual-daily users, 7.8% became concurrent non-daily users, 16.4% became exclusive vapers, and 5.8% quit both. Predominant vapers were more likely to report using e-cigarettes to cut down and quit smoking compared to other concurrent user groups. 98.7% of exclusive vapers reported that vaping will help them stay quit from smoking.

FUNDING: Federal; Nonprofit grant funding entity

SYM17F

***DISCUSSANT**

Joanna Cohen, PhD, MHSc, BSc. Johns Hopkins Bloomberg School of P.

Dr. Cohen will summarize each of the five presentations, highlight the key findings, and discuss implications and future directions.

FUNDING: Unfunded

SYM18A

A QUALITATIVE REVIEW OF MOBILE APPLICATIONS FOR SMOKING CESSATION

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Smoking is a leading cause of preventable death in the world. Though most smokers want to quit, very few achieve this annually, thus more effective and scalable treatments are needed. Mobile health is a promising tool for helping smokers quit, and smartphone apps are positioned to be a major player in the efforts to reduce smoking globally. This talk will report and expand on findings from a recent review of smartphone apps for smoking cessation, including technical and theoretical bases for design, and data on clinical efficacy and effectiveness. This review used the Obesity-Related Behavioral Intervention Trials (ORBIT) model to categorize and discuss smartphone apps for smoking cessation. This talk will additionally evaluate apps according to the new American Psychiatric Association

guidelines to rating mental health apps. Thirty-three smartphone apps for smoking cessation were identified in 55 papers, designed for general/specific populations. App intervention features were under-specified and sometimes inconsistent (e.g. gamification), and most apps used a small number of features. All apps identified a theoretical basis. Most apps were studied at ORBIT phase I, followed by phase II studies, with very few phase III-IV efficacy or effectiveness trials, in line with prior reviews. Available clinical efficacy data is promising but limited. Findings indicate that intervention features of smartphone apps for smoking cessation should be better specified, and consistent terms used in reporting. Studies of apps have been conducted using diverse methods (qualitative, efficacy, translational). However, there is a need for greater programmatic effort such that early phase (i.e. design) research is conducted prior to larger clinical trials and is reported. Further, such research might improve clinical outcomes. More work is needed to link specific app features with clinical outcomes. Findings support ORBIT as an effective model to summarize and guide research. Continued improvements in early-phase research, adherence to evidence-based guidelines and clinical testing should accelerate the efficacy and quality of smartphone apps for smoking cessation.

FUNDING: Federal

SYM18B

JUST-IN-TIME ADAPTIVE INTERVENTIONS IN MOBILE HEALTH

Marianne Menictas, PhD, Susan A. Murphy. Department of Statistics, Harvard University.

Behavioral interventions for prevention and delay are an important part of the fight against smoking lapse in smokers attempting to quit. Although stress is a known predictor of relapse to smoking, a challenge faced by scientists is how and when to trigger an intervention to prevent a smoking lapse. Adaptive interventions are sequences of decision rules that specify how the intensity or type of treatment should change depending on the individual's needs. Just-in-time adaptive interventions (JITAs) are a special type of adaptive intervention where, thanks to mobile technology like wearables and smartphones, an intervention can be delivered at the right time, within the right context, by adapting to an individual's changing internal and contextual state. Wearables and smartphones contain a lot of information about when an individual is and is not at risk for engaging in harmful behavior. In JITAs, utilizing this information combined with individuals' preferences and current context can lead to appropriate interventions whenever and wherever they are needed. A Micro-Randomized Trial (MRT) is a trial design used for building JITAs. In MRTs, individuals are randomized hundreds or thousands of times over the course of the study. The goal of an MRT is to optimize mobile health interventions by assessing the effect of intervention components and assessing whether they vary with time or the individual's current context. Through MRTs we can gather data to build optimized JITAs. In the Sense2Stop program, MRTs are being used to build a JITA that prompts individuals to perform stress-reduction exercises to determine whether they can help with avoiding or delaying relapse. The goal is to reduce stress quickly so that individuals do not lapse back into smoking. Individuals' stress is measured each minute via electronic wristbands and an electronic chest band, by gathering data on heart rate, rhythm and movement. We outline the scientific motivation for JITAs and MRTs, define their fundamental components, and highlight design principles related to these components. Examples of JITAs and MRTs from various domains of health behavior research will be used for illustration.

FUNDING: Federal

SYM18C

A MACHINE LEARNING APPROACH TO IDENTIFYING RESPONSE FATIGUE AND NON-COMPLIANCE IN ECOLOGICAL MOMENTARY ASSESSMENT

Emily T. Hébert, DrPH, Ashley J. Mathews, Daryl W. Geller, Akshay Gaur, Summer G. Frank-Pearce, Michael S. Businelle, Darla E. Kendzor. Oklahoma Tobacco Research Center.

Significance: Ecological momentary assessment (EMA) allows for a more granular understanding of the relationship between affect, socioenvironmental context and smoking lapse. EMA involves frequent measurements in an individual's natural environment, reducing recall bias that is characteristic of self-report instruments. Yet, there is no gold standard method of validating EMA reports of momentary smoking. Lack of adherence to self-initiated event reporting and participant response fatigue (i.e., when the quality of the data provided begins to deteriorate in association with participant burden) can lead to misclassification of smoking lapse or abstinence. The purpose of this study is to use machine learning methods to identify response fatigue and predict non-compliance with EMA protocols. **Methods:** Participants were adults from a clinic-based smoking



cessation program. Participants were loaned smartphones and prompted to complete 5 EMAs each day from 1 week pre-quit to 4 weeks post-quit, and to self-initiate an EMA whenever they lapsed. EMAs evaluated mood, smoking urge, environmental context, and smoking lapses. Meta data from EMA reports (e.g., participant time in study, average time to complete each question, grade reading level, etc.) were used as potential indicators of participant engagement and response fatigue. Gradient boosted decision trees with k-fold cross validation were used to predict EMA completion and response time. Results: A total of 29,618 scheduled EMAs and 8,582 participant-initiated EMAs were included for analysis. Participants completed 81.3% of all prompted EMAs. Predictive features included question type, number of times a question has been seen, order of questions, and participants' median response time. Final models, including practical suggestions for identifying response fatigue will be discussed. Conclusion: Accurate identification of momentary smoking episodes and their context is crucial for the development of effective just-in-time adaptive interventions for smoking cessation. The methods discussed herein may be effective in identifying patterns of non-compliance and fatigue that can be used to refine future EMA study protocols.

FUNDING: Federal; State

SYM18D

A PRECISION MEDICINE APPROACH TO MOBILE HEALTH DELIVERY USING A NOVEL MACHINE LEARNING RECOMMENDER SYSTEM

Matthew Engelhard, MD, PhD. Department Psychiatry & Behavioral Sciences, Duke.

Smoking cessation mobile health interventions generate large volumes of user data that can be used to develop novel analytic methods that can advance the precision medicine agenda. Background app analytics provide a wealth of time series data documenting user-app interactions that can be modeled as a function of demographic factors and other baseline characteristics. This approach can improve researchers' ability to understand engagement and predict how these technologies will be utilized by specific sub-populations. However, individual users also have distinct preferences that cannot be predicted from their personal characteristics, yet may affect engagement and intervention effectiveness. Learn to Quit (LTQ) is a theory-based smoking cessation app that contains 28 learning and skills modules designed and adapted for individuals with serious mental illness. In a recently completed pilot randomized controlled trial (N=62), results showed that higher engagement with LTQ modules was associated with higher smoking cessation reductions. Despite its promise, background analytics of LTQ usage indicated that only 61% of participants completed all modules, suggesting that new strategies to increase app engagement among individual users might improve smoking cessation outcomes. In this talk, drawing from ~34,000 data points from LTQ distributed across a 4-month period, we present a predictive model of user engagement that incorporates personal characteristics (e.g., age, sex, nicotine dependence) as well as learned user-specific preferences (e.g., repeated modules). Our approach uses a hierarchical multitask point process model based on a combination of known and unknown (i.e., latent) factors. This approach allows us to (a) make initial module recommendations based on personal characteristics, and (b) personalize those recommendations as data for a given user is collected. Together, these features allow us to personalize LTQ for individual smokers, which may improve its effectiveness as a cessation intervention. Further, this approach and the resulting understanding of smoker preferences are applicable to other smoking cessation mobile health interventions.

FUNDING: Federal

SYM19A

A QUALITATIVE STUDY OF SMOKERS' RESPONSES TO CIGARETTE PACK INSERTS: EVIDENCE FROM AUSTRALIA

Emily Brennan, PhD¹, Sarah Durkin¹, Michael Murphy², Cathy Segan¹, Amy Collier¹, Melanie Wakefield¹. ¹Cancer Council Victoria, ²MMResearch.

Background: Despite the availability and widespread promotion of cessation support services such as the Quitline and the quitnow.gov.au website, engagement with these services is low among Australian smokers. A novel approach to supporting smokers to quit is through cigarette pack insert cards that promote the benefits of quitting and provide advice on how to quit. This study aimed to explore reactions to potential inserts that were developed specifically for Australian smokers, who have been exposed to tobacco plain packaging with large graphic warnings, substantial annual increases in tobacco taxes, and modest anti-tobacco mass media campaign activity. Methods: Four focus groups were conducted with 25-60 year-old at least weekly smokers in Melbourne, Australia in April 2019. Smokers were shown nine sets of inserts (26 inserts in total), each addressing a different topic. Smokers provided feedback on content and the design features

that varied across inserts. Results: Smokers positively appraised the concept of pack inserts. Inserts about financial benefits of quitting, and about benefits experienced by the smoker's family and friends, received particularly favourable responses, while messages focused on the emotional benefits of quitting were received less favourably. Smokers also tended to prefer concrete tips on dealing with cravings and preparing for quit attempts rather than messages encouraging them to mindfully focus on their cravings. Preferences for certain formats and styles (e.g., photos vs. illustrations, checkboxes), tended to be mixed. Smokers noted that inserts may help some smokers more than others, and that wide variety in content and style would attract attention. Conclusions: Pack inserts could provide Australian smokers with additional motivation and support to quit by delivering messages that promote the benefits of quitting, encourage them to use evidence-based treatments, and address barriers to treatment, every time they open a new cigarette pack. Developing inserts that cover a range of topics and vary in style and format could help sustain novelty and attention to the inserts.

FUNDING: Nonprofit grant funding entity

SYM19B

THE EFFECTS OF CIGARETTE PACK INSERTS WITH EFFICACY MESSAGES ON RESPONSES TO HEALTH WARNINGS

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Background: Fear appeal theories suggest that threatening tobacco warnings may not have the intended impact if efficacy to deal with the threat is low. Inserts inside cigarette packs which provide information aimed at increasing self-efficacy and response efficacy to quit may reduce negative reactions to warnings. Methods: Adult smokers (N=466) in the UK participated in an online study. Participants were randomised to view either four control inserts or four efficacy inserts, prior to viewing either three pictorial (high threat) or three text-only (low threat) warnings mocked up on cigarette packs. After viewing the inserts, participants reported their self-efficacy and response efficacy, as well as their reactions to the warnings; all responses were on a 1-5 scale. Results: Although participants reported that the efficacy inserts were more helpful for quitting than the control inserts (Mean Difference (MD)=0.82, 95% CI=0.68 to 0.96, p<0.001), efficacy inserts did not increase either self-efficacy (MD=0.05, 95% CI=-0.18 to 0.27, p=0.7) or response efficacy (MD=0.11, 95% CI=-0.03 to 0.24, p=0.5). As expected, participants viewing pictorial warnings reported higher perceived message effectiveness (PME; p=0.002), negative affect (p=0.003) and reactance (p<0.001) than those viewing text warnings. Crucially, there was little evidence that the efficacy insert condition influenced any of the reactions to the warnings (PME: p=0.2, negative affect: p=0.6, reactance: p=0.2) and there were no insert type x warning type interactions (all p>0.3). Conclusions: Contrary to predictions based on fear appeal theories, viewing efficacy inserts did not impact responses to threatening (i.e. pictorial) warnings. This may be because the inserts did not increase self-efficacy or response efficacy. The findings suggest that other types of messages and interventions may be necessary to increase smokers' efficacy, and additional research examining these possibilities will be discussed.

FUNDING: Academic Institution

SYM19C

HOW CAN CIGARETTE PACKAGE INSERTS PROMOTE SMOKING CESSATION? TESTING MEDIATION IN AN ECOLOGICAL MOMENTARY ASSESSMENT STUDY

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Background: The tobacco industry has used cigarette package inserts to communicate with smokers for over a century, but Canada is the only country that has used inserts for communicating cessation messages to smokers. FDA has regulatory power to adopt inserts for communicating with smokers, but more research is needed to determine their effectiveness. Methods: 23 smokers participated in a 14 day Ecological Momentary Assessment (EMA) study in which they received a 2-week supply of cigarettes. A cross-over design was used, in which half the participants were randomly assigned to receive cigarette packs with inserts for first week and half for the second week. Inserts included four rotating messages to promote response efficacy (i.e., cessation benefits) and self-efficacy (i.e., tips to quit). Approximately four times a day, EMA assessed hypothesized mediators of insert effects (i.e., self-efficacy to cut down on cigarettes, self-efficacy to quit smoking, response efficacy, motivation to quit, all with a 1 to 7 response scale), for which daily means were calculated. Linear mixed-effects models regressed motivation to quit on insert exposure (yes, no) and hypothesized mediators.



The product-of-coefficients method with bootstrapping was used to assess whether efficacy beliefs mediated the association between insert exposure and motivation to quit. Results: During the insert period, participants reported greater self-efficacy to cut down ($b=0.20$, 95% CI=0.05,0.34), self-efficacy to quit ($b=0.24$, 95% CI=0.13,0.36), response efficacy ($b=0.14$, 95% CI=0.04,0.23), and motivation to quit ($b=0.21$, 95% CI: 0.04,0.39). Self-efficacy beliefs mediated the association between the insert exposure period and motivation to quit (self-efficacy to cut down: $b=0.06$; 95% CI=0.01,0.11; self-efficacy to quit: $b=0.09$, 95% CI=0.03,0.15), but response efficacy only had a direct effect on motivation to quit ($b=0.23$, 95% CI=0.06, 0.40). Conclusions: These results suggest that inserts with messages to enhance self-efficacy may promote smoking cessation. Future research should focus on cessation behaviors and potentially synergistic effects when inserts are used with pictorial warnings.

FUNDING: Federal

SYM19D

THE RESPONSE OF SMOKERS TO PACK INSERTS PROMOTING CESSATION: A NATURALISTIC STUDY IN SCOTLAND.

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Background: While cigarette pack inserts encouraging cessation would be an inexpensive means of communicating with smokers, few studies have considered how they respond to these. We explored how smokers in Scotland responded to pack inserts promoting cessation. Methods: A naturalistic design was employed, where daily cigarette smokers (N=114) recruited in Scotland between February and May 2018, had pack inserts promoting cessation included in their packs for one of the two weeks of the study. Participants completed an online survey, each Thursday (midweek) and Sunday (weekend), exploring efficacy, threat, warning salience, risk and fear perceptions, pack avoidance, feelings about smoking, and cessation related-behaviours. They also completed an online survey at the end of the study exploring their response to having the inserts in their packs. Results: When comparing midweek responses, participants reported significantly higher motivation to quit when the inserts were in their packs ($p=0.031$). For the weekend responses, participants were significantly more likely to look closely at the warnings on their packs ($p=0.003$), and think about what they were telling them ($p=0.013$), when the inserts were in their packs. At the end of the study, 42% reported reading or looking closely at the inserts often or very often (34% sometimes, 16% rarely, 7% never). Over two-thirds reported retaining the inserts (31%) or putting them back in their pack (38%), with only 8% discarding them without reading. When asked to think about the days when they were using the inserts, participants were more likely to be concerned about the dangers of smoking (53% vs 14%), aware of the benefits of quitting (55% vs 15%), feel optimistic about their chances of quitting (43% vs 19%), feel confident that they could quit (39% vs 19%), and feel motivated to quit (51% vs 15%). Three-fifths (61%) thought that inserts would be a good way to provide information to smokers about quitting, and two-fifths (43%) agreed/strongly agreed that having inserts in every cigarette pack might help if they decided to quit. Conclusions: Pack inserts promoting cessation are an additional means of reaching smokers.

FUNDING: Nonprofit grant funding entity

SYM20A

YOUTH PERCEPTION RESEARCH AND THE PUBLIC HEALTH STANDARD AT FDA

Dennis Henigan, JD. Campaign for Tobacco-Free Kids.

The Family Smoking Prevention and Tobacco Control Act specifies the criteria that govern the information tobacco companies must submit to FDA to support Premarket Tobacco Product Applications (PMTAs) and Modified Risk Tobacco Product (MRTP) Applications. Dennis Henigan's presentation will provide an overview of the public health standard governing FDA authorization of the marketing of new tobacco products and modified risk claims for tobacco products, including the importance of assessing the impact on potential youth initiation of tobacco products. He will also discuss the importance of youth perception studies in applying the public health standard, the failure of industry to furnish such data in support of their PMTAs and MRTP Applications, how FDA has addressed issues surrounding the use of youth perception studies, and the response of public health groups to issues concerning the role of youth perception studies in meeting the public health standard.

FUNDING: Unfunded

SYM20B

CONSIDERATIONS FOR ETHICAL INVESTIGATIONS INTO YOUTH PERCEPTIONS OF TOBACCO PRODUCTS

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The primary goals of the Tobacco Control Act are to prevent Americans, especially youth, from starting to use tobacco, encourage current users to quit, and reduce the harms of tobacco use. In order to meet the goal of preventing youth initiation and progression of use, it is essential to understand the appeal and addictive potential of various tobacco products among youth. Perception and biobehavioral product exposure studies are key components of such investigations. This presentation will describe ethical ways in which such investigations could be safely conducted among youth, including what kinds of studies could not be conducted, and who could be included in such studies. The presentation will also introduce guidances that are available from the NIH for conducting such studies. Evidence from ongoing studies that include exposure of youth to nicotine and flavors in e-cigarettes, as well as exposure of youth to e-cigarette ads will be used as examples.

FUNDING: Federal

SYM20C

YOUTH PERCEPTIONS OF IQOS MARKETING: IMPLICATIONS FOR REGULATION OF NOVEL TOBACCO PRODUCTS

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Background: The FDA has the authority to regulate all tobacco products, including authorizing marketing of new products and restricting marketing of existing products, all with an eye towards protecting public health. In so doing, the FDA must review data on youth perceptions that informs their regulation. In this presentation, we will provide results from several studies that should directly inform FDA regulation: Philip Morris International's (PMI) proposed IQOS reduced risk and reduced exposure claims, use of colorful packaging to denote flavors and product characteristics, and perceptions of nicotine levels and harm of Altria's Juul brand e-cigarette. Methods: Data come from a 4-year (8 waves) longitudinal study of over 700 youth recruited from 9th and 12th grade in California. Surveys were administered using Qualtrics, and asked questions about tobacco use, perceptions of different tobacco products (including Juul and IQOS), and safety and nicotine levels. Included are experiments embedded within the survey, whereby participants were randomly exposed to ads and marketing claims and then queried about their understanding and perception. Results: Findings across the studies show that: (1) youth exposed to reduced PMI's reduced exposure claim perceive lower IQOS risk than controls; (2) youth can identify flavors and flavor characteristics simply from the colors used on cigarette packages; (3) youth believe ads for flavored e-liquids are targeting their age group and those younger than them; and (4) youth lack an understanding of the harms and nicotine levels in Juuls and other novel pod-based e-cigarettes. Conclusions: Youth are susceptible to and misunderstand such claims and such misperceptions lead to tobacco-use initiation, thereby putting youth – a large swath of the population – at risk for tobacco-use initiation and lifelong nicotine addiction. Research on youth perceptions, using ethical methods that protect youth, must be considered by FDA when deciding whether to authorize new products, allow claims of reduced risk/reduced exposure, product packaging, and flavors.

FUNDING: Federal; Academic Institution

SYM20D

MECHANISMS FOR PRODUCING AND CORRECTING TOBACCO PRODUCT MISINFORMATION CREATED BY ADVERTISING

Joseph NICHOLAS Cappella, MA, PhD¹, Stefanie Gratale². ¹University of Pennsylvania, ²University of PA.

Advertising for tobacco products does not specifically claim that the product is healthy or harmless or risk-free. Yet tobacco product advertising and other forms of pro-tobacco messaging (e.g. social media and internet commentary) can produce misinformed beliefs through various mechanisms including inviting inferences and activating cognitive associations in members of the target audience. Research in our lab has examined some of these processes in smokers and former smokers especially in the context of ENDS products and organic tobaccos. Research from our group has also examined techniques to avoid and correct such false inferences including the use of corrective messages that employ narrative, testimonial, and visual elements that engage the audience cognitively



and emotionally even when the audience identifies the message as high avoidance. Recent work recognizes the importance of purportedly minor linguistic choices and techniques to inoculate susceptible audiences against misleading information. To predict the impact of advertising for new tobacco products on susceptible audiences requires understanding the well-established, but subtle, cognitive and behavioral mechanisms of influence. To prevent false inferences and correct existing ones in vulnerable populations also requires additional research into the persuasive processes effective not only with the informational base of belief but the emotional base as well.

FUNDING: Federal

SYM21A

TOBACCO SCREENING AND TREATMENT OF PATIENTS WITH A PSYCHIATRIC DIAGNOSIS, 2012–2015

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Introduction: Smoking disproportionately affects people with psychiatric diagnoses. This study sought to identify rates of tobacco screening, counseling, and medication orders during outpatient medical visits with adults who have a psychiatric diagnosis in the U.S. Methods: Data from the 2012–2015 National Ambulatory Medical Care Survey were examined to calculate the proportion of outpatient medical visits with people who have a psychiatric diagnosis (N=15,410) that included tobacco screening, counseling, or smoking-cessation medications orders. Weighted, adjusted logistic regression models were used to estimate the associations between patient and visit factors with odds of tobacco screening and treatment. Results: Overall, 72% of visits included tobacco screening, 23% of visits with tobacco users included cessation counseling, and 4% of visits with tobacco users included a cessation medication order. Compared to visits for a non-psychiatric condition, visits were less likely to include tobacco screening if they were for an affective disorder (aOR=0.58, 95%CI=0.44-0.77) or alcohol or substance abuse disorder (aOR=0.43, 95%CI=0.27-0.67). Visits with non-Hispanic Black patients (versus non-Hispanic White) were less likely to include tobacco screening (aOR=0.43, 95%CI=0.27-0.67), as were visits with a patient who had Medicaid (versus private) insurance (aOR=0.71, 95%CI=0.52-0.97) and visits to a psychiatrist (versus primary care physician; aOR=0.27, 95%CI=0.19-0.40). Compared to visits for a non-psychiatric condition, visits were less likely to include cessation counseling if they were for schizophrenia (aOR=0.23, 95%CI=0.06-0.96), an affective disorder (aOR=0.27, 95%CI=0.15-0.49) or an anxiety disorder (aOR=0.39, 95%CI=0.22-0.70). Visits were also less likely to include cessation counseling if they were with a Hispanic (versus non-Hispanic White) patient (aOR=0.48, 95%CI=0.26-0.89) or a self-pay (versus private insurance) patient (aOR=0.41, 95%CI=0.20-0.82). Conclusions: While most visits in the U.S. with a person who has a psychiatric condition include tobacco screening, few include cessation counseling or cessation medication orders.

FUNDING: Unfunded

SYM21B

USING FINANCIAL INCENTIVES TO REDUCE CIGARETTE SMOKING AMONG CLIENTS OF A COMMUNITY-BASED MENTAL HEALTH CENTER: A PILOT STUDY

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Significance: While impressive declines in cigarette smoking prevalence have taken place over recent decades, smoking rates remain unacceptably high in certain sub-populations. One such group is individuals with severe mental illness and co-occurring substance use disorders. Innovative intervention strategies are needed to reduce smoking in this high-risk group. The current study tested the effectiveness of providing financial incentives as a reward for reducing smoking in a sample of clients at a community-based mental health center. Methods: We invited 167 clients with a nicotine dependence diagnosis to participate in a six-session smoking cessation study. Of these individuals, 71 enrolled in the study, and 45 (mean age=48; 53% female) completed enough sessions (at least four) to be included in these analyses. We assessed baseline number of cigarettes smoked in the past day and carbon monoxide levels at the first three sessions. Starting with session four, participants were rewarded with a \$50 pharmacy gift card if their carbon monoxide level was lower than the mean of their first three sessions. We used the Wilcoxon Signed Rank Test to compare the mean carbon monoxide level and number of cigarettes smoked in the past day in the baseline sessions to session four, five, and six. Results: Carbon monoxide levels were significantly lower than baseline at session four (n=45; p=.002) but not at session five (n=40; p=.47) or at session six (n=35; p=.96). Self-reported number of cigarettes smoked in the past day

were significantly lower than baseline at session 4 (n=44; p=.001), at session five (n=40, p=.001), and at session six (n=34, p=.002). Conclusions: The result of this pilot study suggest that financial incentives may be effective in the short-term to reduce cigarette smoking among individuals with mental illness and co-occurring substance use disorders. To continue to decrease smoking and eventually reach cessation, however, our results indicate that additional intervention strategies may be needed to support the clients.

FUNDING: Academic Institution

SYM21C

A RANDOMIZED CONTROLLED TRIAL OF A SUSTAINED CARE CESSATION INTERVENTION

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Significance: Individuals with serious mental illness (SMI) smoke at significantly higher rates than those without SMI. We compared a technology-assisted, sustained care cessation intervention (SusC) vs. usual care (UC) in smokers hospitalized for psychiatric disorders. SusC was adapted from a conceptually similar intervention with demonstrated efficacy among general hospital smokers. Methods: A total of 342 adult smokers receiving inpatient psychiatric care were randomized to either SusC or UC. All participants received brief tobacco education, delivered by a hospital nurse. In addition, SusC participants received a 40-minute, motivational interviewing (MI) session in hospital, and upon discharge, 4 weeks of transdermal nicotine patches (TNP) and up to 8 automated interactive voice response (IVR) messages, during which they were offered free telephone cessation counseling and another 4 weeks of TNP. Outcomes included 7-day point prevalence abstinence at 6-month follow-up, biochemically verified with CO = 8 ppm and saliva cotinine < 15ng/ml. Informant report was used when biochemical validation could not be obtained. Results: Of the 342 participants, 49.4% were female, 18.1% were Latinx, 21.3% were racial minorities and 67.8% reported household incomes < \$24,999. SusC participants were more likely than UC participants to report using any tobacco-cessation treatment in the 6 months after hospital discharge (74.6% vs. 40.5%, p<0.0001), including counseling (37.3% vs. 1.1%, p<0.0001) and pharmacotherapy (71.0% vs. 37.0%, p<0.0001). Verified abstinence rates were 18.9% (SusC) vs. 9.8% (UC) at 6-month follow-up. A generalized linear model (GLM) showed significant overall differences in abstinence rates in SusC vs. UC (p = 0.023). Conclusion: A technology-assisted, sustained care tobacco cessation intervention for smokers hospitalized for psychiatric disorders resulted in greater utilization of tobacco cessation resources and higher rates of tobacco cessation at 6 months post-hospital discharge. This SusC intervention holds promise as a useful and effective strategy to promote tobacco cessation in smokers with psychiatric illness.

FUNDING: Federal

SYM21D

SIMULATING THE POTENTIAL IMPACT OF WIDESPREAD CESSATION TREATMENT FOR SMOKERS WITH DEPRESSION

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Significance: Adults with major depression (MD) have significantly higher smoking rates compared to those without MD. Tobacco control advocates have long called for integrating cessation treatment in mental health settings. Yet the long-term population health benefits of doing so have never been estimated. Methods: We use a system dynamics model to evaluate the mortality benefits of widespread cessation treatment for smokers with MD. We calibrate this model to data on smoking, MD episodes, and mental health service utilization from the National Survey on Drug Use and Health 2005-2015, integrating known interaction effects between smoking and MD. We simulate hypothetical interventions that assume 100% uptake of pharmacological cessation treatment in 2018 among adult smokers seeing mental health professionals for their MD (quitting RR=1.59, 95% CI: 1.23-2.05), evaluating smoking-attributable mortality in the population through 2050. We apply this intervention to the proportion of comorbid smokers who access mental health services, and furthermore assess the impact of increased mental health service utilization. Results: Assuming all adult smokers with MD who access mental health services used pharmacological cessation treatment in 2018, this would avert ~31,400 premature deaths (95% range: 12,900-52,600) and result in ~704,400 life-years gained (LYG) (95% range: ~288,700-1,186,600) by the year 2050.



If integrated cessation treatment was accompanied by a 20% overall increase in mental health service utilization, this would result in an additional ~6,100 lives saved and ~142,500 LYG. This represents only ~6% of the ~642,300 total smoking-attributable deaths and 13.8 million life-years lost expected among adults with MD from 2018-2050. Conclusions: Under highly optimistic intervention scenarios, the benefits of integrating cessation treatment into mental health settings are modest. More aggressive strategies are needed to meaningfully reduce the tobacco use disparity between those with and without behavioral health conditions. Future work could consider the cessation potential of e-cigarettes or policies that reduce smoking initiation in comorbid populations.

FUNDING: Federal

SYM22A

TOBACCO PRODUCT REVIEW AND POPULATION HEALTH STANDARD

Priscilla Callahan-Lyon, MD, FACP. U.S. Food and Drug Administration.

The Tobacco Control Act establishes a population health standard against which FDA must evaluate its tobacco regulatory decisions, including product review. In particular, the evaluation of premarket tobacco product applications (PMTAs) and modified risk tobacco product applications (MRTPAs) requires an assessment of the impact of a marketing authorization on both the individual, as well as the population as a whole. "The population" is understood to be comprised of groups differing in their tobacco use status for whom the marketing of a new modified risk product will necessarily have differing (sometimes divergent) implications--e.g., current adult smokers vs. never smokers. As such, the risks and benefits for each of these groups are assessed and weighed. In addition to understanding the toxicity of the product, assessment of a PMTA or MRTPA entails anticipating how the product will be used and by whom. Evidence to inform this assessment often requires evaluating and integrating multiple lines of evidence across a wide range of scientific disciplines. This presentation will describe the statutory standards that apply to PMTAs and MRTPAs, the multidisciplinary review process used by FDA to evaluate and integrate findings, and the complexities inherent to such a comprehensive review process. We will use examples of PMTAs and MRTPAs reviewed by the Agency to highlight how different types of evidence can be used to inform critical questions that CTP reviewers assess in the evaluation of the products through these pathways. This talk will also highlight unique features of the MRTPA pathway, both in the standards involved, as well as the review process itself, including the requirements for making the application itself publicly available and the involvement of the Tobacco Product Scientific Advisory Committee (TPSAC). Finally, we will discuss the challenges associated with the implementation of a population health standard as it applies to product review, including limitations in the evidence and managing uncertainty.

FUNDING: Federal

SYM22B

USE OF PRODUCT SCIENCE AND NONCLINICAL DATA TO INFORM TOBACCO PRODUCT REVIEW AND REGULATION

Mayo J. Wright, PhD. U.S. Food and Drug Administration.

The marketing pathways set out in the Federal Food, Drug and Cosmetic (FD&C) Act require FDA to evaluate tobacco products either against another specific product, in the case of the substantial equivalence (SE) pathway, or against tobacco products on the U.S. market, in the case of the premarket tobacco product application (PMTA) and modified risk tobacco product application (MRTPA) pathways. Product science (e.g., chemistry, engineering, microbiology) and nonclinical science (e.g., toxicology, environmental science) data play an important role in these evaluations. The type of data that may be most helpful in evaluating a tobacco product application is often related to the application pathway used and type of tobacco product being evaluated. Relevant product science data typically includes product composition (e.g., tobacco blends, flavor ingredients), product performance (e.g., tar, nicotine, and carbon monoxide (TNCO) or harmful or potentially harmful constituents (HPHC) analysis, nicotine release rates), design parameters (e.g., ventilation, porosity, surface area), or microbial implications (e.g., bacteria or mold counts). Relevant nonclinical science data typically also includes product composition and content or yield of HPHCs and other toxicants. The toxicological evaluation of HPHCs considers toxicity of constituents in their original forms as well as new constituents that may be created as tobacco products are used. Data from in vitro toxicology studies may be informative for some tobacco product applications, although it is important to verify that the methods and study endpoints can provide relevant toxicological comparisons.

Data from in vivo toxicology studies can also be informative for tobacco product applications, though FDA supports the replacement, reduction, and refinement of animal studies where appropriate.

FUNDING: Federal

SYM22C

EVALUATION OF TOBACCO PRODUCT PERCEPTION AND INTENTION DATA TO INFORM TOBACCO PRODUCT REVIEW

David B. Portnoy, PhD, MPH. U.S. Food and Drug Administration.

For review of new tobacco products through the premarket tobacco product application (PMTA) pathway, the Tobacco Control Act requires that FDA consider the impacts of marketing the product on the population as a whole, specifically taking into account the likelihood of use of the product both among current tobacco product users and nonusers of tobacco products. For these new products undergoing review by FDA, in the absence of observational data to identify current users of the product, the likely users of the products may be identified through studies that assess the public's perceptions about the products, their appeal to various age and tobacco use groups, and subsequent intentions to try and use the product. Included in that evaluation of nonusers is a focus on potential youth initiation with the product. Tobacco product perception data is also critical in FDA's review of modified risk tobacco product applications (MRTPA), a key component of which is FDA's evaluation of comprehension of the modified risk claims proposed to be used for the tobacco product. For MRTPA, tobacco product perception studies evaluate the claims on packaging or advertising. For both these application pathways, well-designed studies that focus on perceptions, intentions, and comprehension are critical to FDA's overall evaluation. Within that context, this presentation will (1) explain the importance of tobacco product perception and intention studies in the context of FDA's review of PMTA and MRTPA, (2) give examples of tobacco product perception and intention studies that have been used in previous applications to FDA, and (3) discuss best practices for conducting tobacco product perception and intention studies in the regulatory context. Finally, we will (4) highlight limitations in collecting perception and intention data, especially among youth, and (5) discuss challenges with integrating tobacco product perception and intention data with other sources of information about potential tobacco product users in a premarket setting.

FUNDING: Federal

SYM22D

RATIONALE AND APPROACH TO PRODUCT ADVERTISING AND MARKETING RESTRICTIONS

Emily C. Talbert, MPH. U.S. Food and Drug Administration.

Under the Family Smoking Prevention and Tobacco Control Act, FDA has a statutory mandate to ensure that the marketing of a new tobacco product is appropriate for the protection of the public health and that the marketing of a modified risk tobacco product (MRTP) will benefit the population as a whole. Part of FDA's review under the premarket tobacco product application (PMTA) and MRTP application pathways is aimed at determining if the marketing of a tobacco product would increase or decrease the likelihood that those who do not currently use tobacco products will start using them. Among non-users, youth are a significant population of concern as their current stage of brain development makes them especially susceptible to both nicotine addiction and the powerful influence of tobacco product labeling, advertising, marketing, and promotion. In this context, and considering the substantial body of scientific evidence documenting the causal link between exposure to tobacco product marketing and youth tobacco use, it is important for FDA to review a new and/or modified risk tobacco product's labeling, advertising, marketing, and promotional materials and plans and to place appropriate restrictions on the product's marketing and related activities to limit youth-exposure. Such determinations are made on a case-by-case basis, and information that is considered in these determinations includes, but is not limited to, information submitted to FDA by a firm seeking marketing authorization regarding the firm's intended labeling, advertising, marketing, and promotion of the tobacco product; use of industry practices known to substantially impact youth trial and uptake of tobacco product use; new and emerging technologies, media, and marketing practices; and existing applicable laws and legal agreements affecting the sales, distribution, marketing, advertising, labeling, and/or promotion of certain tobacco products. These important safeguards will help FDA ensure, on an ongoing basis, that the continued marketing of the tobacco product(s) remains appropriate for the protection of public health.

FUNDING: Federal



SYM23A

A SMARTPHONE-SMARTCARD IMPLEMENTATION OF CONTINGENCY MANAGEMENT FOR SMOKING CESSATION

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Contingency Management (CM) is an operant conditioning and behavioral economics paradigm for drug use cessation. After a half-century of research (over 100 random controlled trials, 7 meta-analyses) efficacy is well established. In 33 nicotine cessation studies (N=21,600), high-certainty evidence indicates that incentives increase smoking cessation not just during treatment but also at long-term follow-up. Despite this evidence base, adoption of CM is poor. Concerns abound regarding the ethics of paying patients money, how to source incentive funds, the logistics of random and witnessed testing and management of intricate accounting. Technology may surmount these obstacles. A patient-centered smartphone-smartcard implementation (DynamiCare Health, Inc., Boston MA) was designed to automate all CM procedures. Participants obtain the app from app stores, undergo in-app orientation, are shipped a pocket-sized "Smokerlyzer" CO test device, receive texts prompting random testing with video selfie monitoring, and receive incentive funds via a smart debit card that blocks risky purchases. The app manages progressive reinforcement schedules and data tracking and presentation. In preliminary findings among 60 pregnant smokers recruited from across the U.S., of 60 who reached an early pregnancy assessment, 14 of 30 (46.7%) quit with incentives, vs. 6 of 30 (20%) with best practices behavioral services ($p < 0.05$). Of 59 who reached the late pregnancy assessment, 11 of 30 (36.7%) quit with incentives vs. 4 of 29 (13.8%) with best practices ($p < 0.05$). Results are consistent with prior literature showing quit rates increasing by factors of 2x–3x. These findings, however, were achieved with remote monitoring in the absence of on-site visits, with good participant satisfaction ratings and acceptance. Investor-funding with a start-up corporate structure may facilitate rapid development cycles for integrating multiple technology solutions. Familiar user-interfaces offer a patient-centric wellness platform. Scalability and, with growing payer interest, sustainability can be good. Results can match outcomes previously found with grant-funded random controlled trials.

FUNDING: Federal; Other

SYM23B

OPPORTUNITIES AND CHALLENGES OF REAL-WORLD RESEARCH ON A WIDELY DISSEMINATED DIGITAL CESSATION INTERVENTION

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Effective, experimentally validated tobacco dependence treatments and practices are well established, codified in a Clinical Practice Guideline that synthesized over 8,700 research articles. Key components of treatment include cognitive and behavioral problem solving/skills training, social support, and medication. However, much of the available data come from randomized clinical trials conducted in research settings, with limited insights regarding real-world effectiveness or potential for dissemination. Digital interventions are well suited to deliver the core components of tobacco dependence treatment on a large scale and in an engaging format. They also provide an optimal laboratory for evaluating effectiveness, mechanisms of action, and population impact. In 2008, Truth Initiative launched BecomeAnEX (EX), a free, multimodal digital smoking cessation intervention grounded in tobacco treatment guidelines and disseminated through a national media campaign. Since then, more than 800,000 tobacco users have joined EX, actively engaging in the interactive tools, multimodal content, and thriving online social network. In 2017, an enterprise version called the EX Program was launched to expand the reach of EX and support Truth Initiative's non-profit mission. EX Program clients span manufacturing, gaming, and transportation industries (among others) where smoking prevalence exceeds the national average and treatment is often underutilized. This presentation highlights the importance – and methodological challenges – of conducting rigorous research in the context of a widely disseminated digital intervention. NIH funding has supported research on comparative effectiveness (R01CA155489), treatment development (R34AA024593), development of social computing methods and secondary data analyses (R01CA192345), and treatment optimization (R01DA038139). Key findings from this work demonstrating effectiveness and population impact will be presented. Methodological issues related to research design and analytic approaches best suited to advance the science of digital interventions will be discussed.

FUNDING: Federal; Nonprofit grant funding entity

SYM23C

DEVELOPMENT, PRELIMINARY EFFICACY, AND REGULATORY OVERSIGHT OF A NOVEL DIGITAL THERAPEUTIC TO TREAT TOBACCO USE DISORDERS IN PATIENTS WITH SERIOUS MENTAL ILLNESS

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Tobacco use disorder affects up to 85% of patients with serious mental illness (SMI), such as patients with schizophrenia spectrum, bipolar, and recurring major depressive disorders. Tobacco use disorder is the primary preventable cause of death in this population, shortening lifespan by 25 years, and contributing to \$100 billion in annual healthcare expenditures. Despite the proven safety and efficacy of several interventions for this population, there are numerous barriers to delivering smoking cessation treatments to SMI patients, such as lack of training to provide behavioral smoking cessation interventions, and prioritization of other psychiatric or health symptoms over tobacco use disorder. Therefore, digital therapeutics holds great promise as an approach to more effectively delivering smoking cessation interventions to individuals with SMI. In previous work we developed Learn to Quit, a smoking cessation app tailored to the needs of individuals with SMI. Learn to Quit's content includes Acceptance and Commitment Therapy, education about the use of NRT, and recommendations from US Clinical Practice Guidelines. In a recent pilot randomized controlled trial of Learn to Quit, the app demonstrated high levels of user engagement and promising cessation outcomes. While ultimately demonstrating the efficacy of this digital therapeutic is critical, it is equally important to secure a path to dissemination that will make it widely available in its target population. To achieve this goal, we sought out feedback about the appropriate regulatory pathway for this product by making a Pre-Submission Meeting request to FDA's Center for Devices and Radiological Health. As a result of this review process we obtained specific recommendations about the design requirements of an FDA-registered randomized controlled trial and gained more clarity about the potential uses of this device if eventually cleared by the FDA and implemented in healthcare settings. In this presentation, we will briefly introduce this novel digital therapeutic, its preliminary efficacy, and discuss our experience pursuing this regulatory process.

FUNDING: Federal

SYM23D

REGULATION OF MEDICAL DEVICES IN A DIGITAL HEALTH ERA

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FDA defines digital health technologies as products that use computing platforms, connectivity, software and/or sensors for healthcare and related uses. In recent years, the Agency has seen increasing interest in applying these technologies to deliver medical care, to develop medical products, and to study medical devices. Not all applications of digital health technologies are regulated, however, and so the Agency has published a number of guidance documents to help articulate a risk-based and functionality-focused approach to regulation of medical devices including digital therapeutics. Recent legislation has codified that risk-based approach, removing some lower-risk general wellness products and clinical decision support tools from the definition of a medical device. The Agency has also recognized the need to devise a regulatory paradigm that better aligns to the software development lifecycle and allows for iterative changes that improve the performance of algorithms while ensuring that standards of safety and effectiveness are met. To that end, FDA is piloting a Software Precertification Program and has recently published a discussion paper outlining a potential approach to regulation of artificial intelligence and machine learning technologies. To support manufacturers in understanding the likely regulatory status of digital health products in development, FDA has established multiple educational tools and mechanisms for receiving Agency feedback. FDA also believes that early engagement with manufacturers of regulated digital health products is critical to supporting innovation and the development of high-quality software-based medical devices. Understanding available options for engagement with FDA will enable manufacturers to receive timely feedback on their products across the total product development lifecycle.



SYM24D

PERCEIVED MESSAGE EFFECTIVENESS OF FDA'S E-CIGARETTE PREVENTION ADS: AN EXPERIMENT WITH U.S. YOUNG ADULTS

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Significance: Perceived message effectiveness (PME) ratings are commonly used to select messages for tobacco prevention campaigns, but have seldom been applied to e-cigarette prevention. In this study, we compared two types of PME applied to e-cigarette ads: *message* perceptions (general perceptions of an ad) and *effects* perceptions (perceptions of how an ad would affect me). We also evaluated young adults' reactions to the US Food and Drug Administration (FDA) new e-cigarette prevention ads. **Methods:** We randomized $N=557$ young adults aged 18-22 to one of two ad conditions: 1) *The Real Cost* e-cigarette prevention ads developed by the FDA (FDA condition) or 2) information-only e-cigarette control ads developed by the Mayo Clinic (control condition). Participants in each condition viewed 2 ads, after which we assessed *effects* perceptions and *message* perceptions (i.e., PME). We then assessed risk beliefs about vaping and intentions to vape. **Results:** Compared to control, the FDA e-cigarette prevention ads received higher ratings on both *message* perceptions ($M=3.82$ vs $M=3.29$; $p<.001$) and *effects* perceptions ($M=4.13$ vs $M=3.82$; $p<.001$). Risk beliefs about vaping were also higher in the FDA ad condition compared to control ($M=3.95$ vs $M=3.79$; $p=.022$), but we found no differences by condition on intentions to vape, which were low ($M=1.59$ in FDA vs $M=1.58$ in control). In multivariate analyses adjusting for covariates and including both types of PME, only *effects* perceptions (not *message* perceptions) were associated with risk beliefs about vaping ($b=.37$, $p<.001$) and intentions to vape ($b=-.26$, $p<.001$). **Conclusions:** This study provides evidence that FDA's new vaping prevention ads were perceived as effective and increased vaping risk perceptions, compared to control ads. Moreover, we found that *effects* perceptions better predicted message impact than *message* perceptions. This is particularly important as the FDA currently uses only *message* perception PME measures to select messages for their campaigns. This research indicates that the FDA should include *effects* perception measures when pre-testing e-cigarette prevention ads.

FUNDING: Academic Institution

SYM24E

NEW PRODUCT, SAME PRACTICES- VAPE INDUSTRY USE OF PEER CROWD-TARGETED MARKETING

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Significance: The vape industry states their products are for adults, yet their marketing merits scrutiny following the surge in youth vaping. Historically, cigarette marketing used audience segmentation to target subgroups of potential smokers, such as peer crowds (values-based subcultures with shared interests and norms common among youth). Examples include marketing of Camel to the Alternative/Hipster (Hendlin, Anderson, & Glantz, 2010) and Kool to the Hip Hop (Hafez & Ling, 2006) peer crowds. While vape marketing clearly targets youth, it is not yet known if peer crowd segmentation is being used, and if so, which crowds are targeted. **Methods:** We reviewed 2015-2018 content from three vape brands (JUUL, Suorin, Blu). JUUL Instagram and online ads were obtained from the Stanford University Research Into the Impact of Tobacco Advertising site; Suorin and Blu content was downloaded from Instagram and the Stanford site. Researchers coded posts ($n=627$) for targeting to youth (e.g., promotion of flavors, bright colors); product use; and targeting of 5 youth peer crowds (Alternative, Country, Hip Hop, Mainstream, Popular). We examined frequencies overall, by brand, and among youth-targeted posts. **Results:** Half of the posts targeted youth, and 53% of those targeted one or more peer crowd. Brands most often targeted the Popular (71% of targeted posts), Hip Hop (24%), and Alternative (22%) crowds. In particular, JUUL targeted Popular youth (83% of peer crowd posts), while Blu targeted Popular (64%) and Hip Hop (36%). Product use was common in youth-targeted (29%) and peer crowd-targeted (38%) posts. **Conclusions:** Despite industry claims, vape marketing often targets youth, and uses psychographic segmentation tactics to target specific youth peer crowds. While cigarette marketing often targeted Hip Hop and Alternative crowds, vape marketing frequently targets the Popular crowd, a group traditionally at lower risk for tobacco use which has reported increasing vape use (Jordan et al., 2019; Charles & Madden, 2018). To address youth vaping, tailored and targeted campaigns incorporating the values and interests of higher-risk crowds are needed to counteract industry marketing.

FUNDING: Other

SYM24A

SAFER \neq SAFE: DEVELOPING AN ANTI-VAPE MESSAGE FROM THE TRUTH ANTI-TOBACCO CAMPAIGN

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When truth, a national, mass-media, youth-smoking prevention campaign launched in 2000, nearly a quarter of all U.S. youth smoked cigarettes. Now, the rise of vaping among youth has been startlingly fast, up to 21% in 2018, and we feel like we're back where we started. Using the lessons learned from almost 20 years of communicating to youth and young adults about tobacco, truth launched their first anti-vaping campaign, Safer \neq Safe, in October, 2018. This presentation will outline the formative research strategies that informed the content of the campaign and the ongoing methods of evaluating its impact among young people. First, substantiated e-cigarette-related facts were tested through surveys and in focus groups for their ability to capture the attention of young people, while informing and motivating them. Second, we used mobile ethnographies, focus groups and in-home interviews for a deeper understanding of how our audience thinks about tobacco and vaping. Using these results, we developed ads and copy-tested them for their impact (percent of anti-vape attitudinal change); message comprehension; emotional response profile (positive passion, disgust, outrage); and truth brand equity attributes. Finally, we evaluated the performance of the ads in-market by continuously monitoring target audience feedback via our media tracking study, assessing ad awareness, receptivity, and vape attitudes among a sample of 240 youth and young adults per week. The qualitative research indicated that vaping represents a gray area for youth and young adults. They believe it is better than smoking, but aside from a conscious desire to be part of this latest trend, they do not know much about vaping. As a result, we found that facts about the nicotine content and health consequences were perceived as motivating and informative among our audience. Copy-testing showed that these ads overall had high likeability, strong perceived relevancy, and clear communication of the "safer is not the same as safe" message. The in-market testing showed increases in important vape knowledge; notably, a 23% decrease in agreement that "Vaping / Using E-cigarettes including JUUL is safe".

FUNDING: Other

SYM24B

PROTECTING YOUNG PEOPLE FROM E-CIGARETTES: AN OVERVIEW OF CDC E-CIGARETTE COMMUNICATIONS

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SIGNIFICANCE: E-cigarettes are the most commonly used tobacco product among U.S. youth, and unprecedented increases in e-cigarette use among youth occurred during 2017-2018. In response to this increase, the Centers for Disease Control and Prevention's (CDC) Office on Smoking and Health (OSH) developed and implemented communication activities intended to reach youth influencers, such as parents, educators, and health care providers, with accurate information about the risks of e-cigarette use among young people. **METHODS:** During March – July 2019, OSH developed and placed: 1) a radio public service announcement (PSA) called "One Brain;" 2) a print ad titled, "Vending Machine;" 3) social media, digital display, and Google advertisements; and 4) a presentation for partners to deliver to youth audiences. This study assessed process measures for these activities, including audience impressions, media value, web analytics, and search results. **RESULTS:** As of June 2019, station PSA directors across the country have aired "One Brain" a total of 1,618 times, resulting in almost 2 million impressions; the average range for number of PSA airings with similar outreach to radio stations is 750 – 1,500. The "Vending Machine" print ad reached approximately 835,550 individuals, yielding \$248,975 in media value, or over seven times the actual cost of the paid placement. During March-July 2019, the social and digital paid placements have achieved almost 23 million impressions. The paid search resulted in nearly 58,000 visits to www.cdc.gov/e-cigarettes, with a click thru rate of 14.53%, which was well above the Google AdWords average click-through rate of 3.17%. The youth presentation was downloaded 900 times in the first week of being posted to the website. **CONCLUSION:** CDC e-cigarette communication activities resulted in significant reach through a number of communication channels. These communication activities successfully provided credible, science-based information on e-cigarettes to key audiences, and the results will be used to guide and enhance future CDC communication activities related to youth tobacco product use.

FUNDING: Federal



SYM24C

YOUTH REACTIONS TO THE FDA'S FIRST HEALTH MESSAGING CAMPAIGN CREATED SPECIFICALLY TO MESSAGE ON THE HARMS OF ENDS USE TO YOUTH

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Background: ENDS use among youth has become a critical public health concern. To address this concern, the FDA recently launched its first health messaging campaign aimed at preventing ENDS use among youth. This presentation describes results of copy testing for this campaign among its target audience. Methods: Between June 2018 and March 2019, two waves of copy testing studies were conducted with 615 youth to assess reactions to health messages aimed at preventing youth ENDS use; one ad was tested in each wave. In order to participate in this study youth had to be between the ages of 13 and 17 and had to either 1) be susceptible to using ENDS or 2) have ever used ENDS. Eligible participants were randomized into an ad viewing exposure group or a control group. Participants in the exposure group were asked questions to assess their comprehension of the main messages of the ads, how believable they found the ads, their level of engagement with the ads, and perceived effectiveness (PE) of the ads. A six-item scale was used to determine PE. Participants in both groups were asked questions about perceptions of and intentions to use ENDS. Differences in responses to questions between control and exposure groups were assessed using t-tests. Results: Main message comprehension was 90% or higher with very few participants (<3%) stating that there was anything confusing or hard to understand about the ads. The ads performed well; 88% or more of youth either agreed or strongly agreed that the ads were believable and approximately 66% of youth either agreed or strongly agreed that the ads were meaningful to them. PE scores for the ads were high, ranging from 4.15 to 4.17. Youth in the ad viewing groups had higher perceptions of risk of ENDS use. For example, agreement with "If I vape I will damage my body" and "If I vape I will become addicted to vaping" and lower intentions to vape in the next 6 months ($p < .05$) were more prevalent in the exposure groups. Conclusion: This study suggests that FDA's first ENDS campaign delivers a clearly understood, believable and engaging message that is perceived effective by the target audience.

FUNDING: Federal



PODIUM PRESENTATION 1

PAPER SESSION 1: ENDS: CHEMICAL ANALYSIS OF ADDITIVES, SALTS, AND EMISSION

POD1-1

CHEMISTRY INSIGHTS INTO TOBACCO PRODUCT FLAVORANTS: E-LIQUID REACTIVITY AND SYNTHETICALLY ALTERED MOLECULES

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This presentation will outline recent results from the Yale TCORS on two topics related to flavorant use in tobacco products: (1) the potential for reactions to occur between e-liquid constituents, and (2) the availability and use of chemically altered compounds with enhanced properties, such as artificial sweeteners and synthetic coolants. (1) Previous work has shown that e-liquids are not final and stable products, but that reactions can occur within them during regular storage conditions. For example, we recently reported the reaction between commonly employed flavor aldehydes such as vanillin or benzaldehyde with the common e-liquid solvents propylene glycol and glycerol during storage conditions to form novel chemical compounds called acetals (e.g. vanillin PG acetal), including in popular Juul e-liquid. These acetals were shown to transfer to aerosol, resist rapid hydrolysis in airway-like conditions, and activate sensory nerves leading to irritation more robustly than the compounds they were formed with (e.g., flavor aldehydes). (2) The second area concerns the detection of compounds that were chemically altered to improve their properties and have been detected in tobacco products: artificial sweeteners are low-calorie compounds and often hundreds of times sweeter than table sugar. We recently showed that wrapping papers of popular US cigarillos contained artificial sweeteners and that artificial sweeteners could be detected in cigarillo wrappers across various flavor labels, including "classic/original", "sweet", and "grape". Synthetic coolants were developed to create an improved cooling effect compared to menthol, yet lacking the characteristic odor of menthol. Artificial coolants were recently shown to be present in e-liquids to substitute for menthol, thereby increasing the cooling effect while decreasing the intensity of the "minty" odor. For both artificial sweeteners and synthetic coolants, little is known about their inhalational toxicology, nor about how these compounds might break down when heated. While the presence and formation of these chemically altered molecules, whether through reactivity (1) or man-made synthetic efforts (2), is increasingly being demonstrated, little is known about the behavior of these compounds once inside the body of tobacco product users. Further research efforts are required to analyze e-liquids for other types of reactions among constituents, and the effects of chemically altered molecules on the human body, with a particular focus on inhalational toxicology.

FUNDING: Federal

POD1-2

SYNTHETIC COOLING AGENTS IN E-CIGARETTE LIQUIDS-CHEMISTRY, PHARMACOLOGY AND EFFECTS ON NICOTINE CONSUMPTION

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Background: Menthol facilitates smoking and tobacco product initiation, which is reflected by the increase in menthol-cigarette use and the high popularity of mint/menthol-flavored e-cigarettes and smokeless products. More recently, e-cigarette vendors have marketed synthetic cooling agents, many of which are chemical derivatives of menthol sharing its cooling effects but lacking its minty smell. These chemicals were briefly tested in cigarettes in the 1980's but knowledge about their current use in tobacco products and their pharmacological and behavioral effects is limited. **Methods:** E-liquid vendor

sites were searched to identify e-liquids containing synthetic cooling agents. GC/MS and GC/FID were used to characterize these e-liquids and test for coolants such as WS-3, WS-5 and WS-23. Calcium microfluorimetry was performed in HEK293t cells expressing menthol receptors (TRPM8 and TRPA1) to determine pharmacological effects. Two-bottle choice (2-BC) mouse behavioral assays were conducted to determine coolant effects on oral nicotine consumption. **Results:** Synthetic cooling agents are widely available from e-liquid vendors, including WS-3, Menthyl Lactate, Menthyl-methyl-lactate and WS-23. Chemical analytical methods determined the presence of select coolants in several ready-to-use e-liquids. Several of these compounds demonstrated stronger pharmacological activity than menthol at TRPM8, but lower TRPA1 activity than menthol. 2-BC assay showed that addition of cooling agents increased oral nicotine consumption in mice. **Conclusions:** Synthetic cooling agents are widely present in ready to use E-liquids and as additives for do-it-yourself (DIY) E-liquids. These agents modulate TRPM8 at or below the cooling-inducing concentrations of L-menthol. Drinking behavior studies in mice also suggests that these compounds reduce nicotine aversion. Taken together, these synthetic cooling agents may replace menthol in the case a menthol ban is enacted. **Funding:** 1R01ES029435-01 (NIEHS); 2-U54-DA036151-06 (NIH/NIDA)

FUNDING: Federal

POD1-3

E-CIGARETTES, METAL EMISSIONS, AND BRAIN TISSUE DISTRIBUTION IN A MICE MODEL

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Objectives: Multiple studies have shown the presence of neurotoxic metals such as lead and manganese in e-cigarette aerosol. We hypothesized that exposure to e-cigarette aerosol can cause accumulation of these neurotoxic metals in brain regions. To examine this hypothesis, our pilot study exposed 3 groups of mice (4 control, 5 "low dose", and 5 "high dose" mice) for 30 days to e-cigarette aerosol. **Methods:** The high-exposure group was treated for 2 hours per day, 5 days a week at an aerosol concentration of 400 mg/m³ and the low dose was exposed for 30 minutes per day at the same concentration level. After mice were sacrificed, the olfactory bulbs, frontal cortex, somatosensory cortex, striatum, substantia nigra, cerebellum, and the extra tissue (rest of the brain) from each mouse were analyzed for metal content using inductively coupled plasma mass spectrometry (ICPMS). Metal levels across the 3 groups were compared using ANOVA with post-hoc Bonferroni correction. **Results:** Comparing the high dose to the controls, nickel, chromium, mercury, and selenium were increased in the olfactory bulb, which is one of the first regions affected in Parkinson's disease. Nickel, chromium and zinc showed increases in the striatum. The frontal cortex, known to be vulnerable to manganese, saw a significant increase of manganese levels. We also observed concerning signs of metal dyshomeostasis, metal imbalance, throughout the brain with significantly decreased levels of several metals including essential metals such as iron, zinc and selenium. **Conclusions:** Our study mapped areas of the central nervous system that are most at risk of metal exposure and metal dyshomeostasis from exposure to e-cigarette aerosol. Additional studies are ongoing including the use of other doses and pathological and neurofunctional assessment to better assess the dose-response and potential health impacts of e-cigarettes on brain health.

FUNDING: Federal; Academic Institution

POD1-4

TYPES OF ACIDS IN 24 "NICOTINE SALT" ELECTRONIC CIGARETTE REFILL LIQUIDS

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Significance: An increasing number of electronic cigarette manufacturers have been offering liquids advertised as containing 'nicotine salts.' A nicotine salt is formed when an acid is mixed in a solution with free-base nicotine. There are many possible types of nicotine salts, and the type of salt could play a significant role in the abuse liability of electronic cigarette liquids. As a first step to understanding nicotine salts, this study sought to identify the types of acids present in a sample of commercially available electronic cigarette liquids. **Methods:** Twenty-four electronic cigarette refill liquids advertised



as containing nicotine salts were purchased for analysis from online vendors. Analytical methods for 11 different organic acids were developed to test these e-liquids for the presence of acids that were deemed likely to be used in a nicotine salt formulation. Analytical chemistry involved a combination of liquid chromatography - mass spectrometry, and gas chromatography - mass spectrometry methods. The results from analysis of the refill liquids were then compared to analytical data for authentic standards of the acids for identification. **Results:** Six of the 11 acids were identified in the liquids. From most to least common, these were: lactic (45.8%, $N=11$), benzoic (33.3%, $N=8$), levulinic (20.8%, $N=5$), salicylic (8.3%, $N=2$), malic (8.3%, $N=2$), and tartaric (4.1%, $N=1$). None of the 11 acids were identified in two of the liquids. Though most liquids contained only one type of acid, three of the liquids contained multiple acids. **Conclusions:** Results demonstrate that several types of salts/acids are currently being used in electronic cigarette liquids. The type of salt(s) used in these liquids may differentially affect the sensations electronic cigarette aerosols produce in the throat and upper airway, or taste characteristics. Type of acid may also influence nicotine pharmacology by altering liquid pH to be more similar to combustible cigarette smoke.

FUNDING: Federal

POD1-5

METAL CONCENTRATIONS EMITTED FROM E-CIGARETTE POD DEVICES: A COMPARISON BY BRAND AND FLAVOR

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Significance: Toxic metals have been detected in the aerosol of cig-a-like, tank-style, and MOD e-cigarettes. However, few POD devices (i.e. JUUL) have been assessed for potential metal exposure. This study measured metal aerosol concentrations in PODs by brand and flavor. **Methods:** We collected aerosols from 36 PODs of 4 leading brands: 6 pods each of BO, PHIX, and Suorin, and 18 of JUUL (6 Virginia tobacco, 6 mint, and 6 mango). Aerosol was collected via droplet deposition in a series of conical pipette tips. Metals were measured using ICP-MS, reported as mass fractions ($\mu\text{g}/\text{kg}$), and log-transformed for statistical analysis. **Results:** Of the four brands, PHIX had the highest median (IQR) concentrations ($\mu\text{g}/\text{kg}$) of Cr (7.12 (0.01, 10.3), Mn (1.71 (0.01, 2.32), Ni (476 (320, 1068), As (195 (134, 272), Sn (38.9 (9.62, 51.3), and Pb (321 (168, 349) (all p -values <0.05). BO generated the highest Cu concentrations, with a median (IQR) of 5,151 (5,000, 5,660) ($p <0.001$). JUUL generated the highest Co concentrations, with a median (IQR) of 25.4 (12.9, 29.9) $\mu\text{g}/\text{kg}$ ($p <0.001$). Among the different JUUL flavors tested, tobacco generated the highest concentrations of Cr (6.26 (1.87, 10.8), Mn (29.3 (8.73, 34.8), Cu (26.0 (17.6, 33.6), Sb (0.47 (0.01, 0.58), and Pb (2.72 (1.79, 3.80) $\mu\text{g}/\text{kg}$, with mint generating the lowest concentrations. Cu and Pb in tobacco were 3 orders of magnitude higher than Mint and Mango flavors. While Co, Ni, and As were comparable across flavors, Sn concentrations were higher in mint and mango (2.61 (2.18, 2.94) and 2.68 (2.52, 3.26)) $\mu\text{g}/\text{kg}$, vs. tobacco (1.39 (0.6, 1.7) $\mu\text{g}/\text{kg}$) ($p=0.003$). **Conclusion:** Metal concentrations in aerosols from 4 brands of popular POD devices varied across the different brands and flavors. Most metal concentrations were highest in PHIX, with Pb being 5 orders of magnitude higher than the lowest (JUUL). Cobalt from JUUL was one order of magnitude higher, while Cu from BO was 5 orders of magnitude higher than the other 3 brands. Among the JUUL flavors, Virginia tobacco generated the highest metal concentrations with the exception of Sn, which was higher in mint and mango, suggesting flavors additionally impact metal exposure.

FUNDING: Federal; State

POD1-6

HEAVY METALS IN ENDS LIQUIDS: A COMPARATIVE ANALYSIS OF PRODUCTS FROM US, UK, CANADA, AND AUSTRALIA

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Significance: As electronic nicotine delivery systems (ENDS) become increasingly popular around the world, there are significant differences across countries in regulatory approaches towards product standards, quality control, marketing and distribution of these products. Lack of product quality standards may create risk for consumers as ENDS products could be a potential source of exposure to several hazardous substances, including toxic heavy metals. **Methods:** ENDS products were purchased in 2017 from four countries with different regulatory frameworks, which are United States, United Kingdom, Canada, and Australia. An array of nicotine refill solutions (liquids) was tested, including fresh liquids from stock bottles, liquids from pre-filled tank systems, and liquids from disposable ENDS devices. Concentrations of heavy metal in liquids

from various ENDS products were measured using graphite furnace atomic absorption spectroscopy. Metals tested include lead, nickel, chromium, and cadmium. **Results:** None of tested metals were detected in stock liquids from all countries. When testing liquids that were used in tanks with a heating coil, some products showed detectable concentrations of lead (25.27-115.57 ppb), nickel (59.25-692.00 ppb), and chromium (569.27 ppb measured in a single product). Cadmium was not detected in any pre-filled samples. Of the three metals that were found in considerable amounts, the majority of liquids and those with the highest metal concentrations came from the United States. **Conclusions:** ENDS liquids stored in bottles without direct contact with device components did not contain measurable levels of heavy metals. Liquids used in ENDS devices from the United States contained higher levels of heavy metals, mainly lead, nickel, and chromium, than those used in products from the United Kingdom, Canada, and Australia.

FUNDING: Federal



PAPER SESSION 2: ANTICIPATED AND UNANTICIPATED EFFECTS OF PRICE ON BEHAVIOR

POD2-1

UNANTICIPATED EFFECTS OF ELECTRONIC CIGARETTE TAXES ON PRICES AND CONSUMPTION

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Significance: As decades of data show that conventional cigarette taxes reduce smoking, several states have begun taxing electronic cigarettes to address vaping. Yet evidence that conventional and electronic cigarettes are economic substitutes suggests that e-cigarette taxes may have unintended consequences, potentially pushing e-cigarette users towards conventional cigarettes if set too high. To consider this, we use Nielsen Retail Scanner data to estimate the impact of conventional and electronic cigarette taxes on e-cigarette prices as well as sales of conventional cigarettes and e-liquid in the US. **Methods:** Data are from the 2011 - 2017 Nielsen Retail Scanner datasets. Regression analyses estimate how the introduction and implementation of different types of e-cigarette taxes—percent of wholesale cost versus per milliliter— affect e-cigarette prices, milliliters of e-liquid sold, and packs of conventional cigarettes sold. **Results:** States that passed percent-of-wholesale-cost e-cigarette taxes saw reduced e-cigarette prices during the period when the tax had been enacted but not yet implemented. This is consistent with strategic responses by suppliers trying to reduce the tax's dollar-impact. Total milliliters of e-liquid sold increased during the post-enactment period, concurrent with reduced prices. Post-implementation, however, both e-cigarette prices and combustible cigarette sales increased, consistent with consumers substituting toward conventional cigarettes when e-cigarettes become more expensive. The impacts of per milliliter taxes were less consistent, and largely statistically insignificant. **Conclusions:** Electronic cigarette taxes may have unexpected impacts on e-cigarette prices, depending on their form and supplier responses. Taxes that increase e-cigarette prices, however, seem to result in increased conventional cigarette sales. **Funding:** This research was supported by the Robert Wood Johnson Foundation Evidence for Action Program.

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POD2-2

IMPACT OF AN E-CIGARETTE TAX ON COMBUSTED CIGARETTE USE IN A LOWER-MIDDLE INCOME COUNTRY

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Significance: Economic theory would suggest that for people who use both e-cigarettes and combusted cigarettes (dual users), high taxes on e-cigarettes could decrease use of e-cigarettes and increase use of combusted cigarettes. To date there has been little research on this issue and no research in lower income countries. Indonesia, which has the 3rd largest population of smokers in the world, implemented a 57% tax on e-cigarette liquid in October 2018. Using a pre-post survey design, we examined how this tax affected tobacco product use. **Methods:** We recruited a cohort of dual users via ads on Indonesian Facebook and Instagram. Wave 1 (pre-implementation) was fielded in September 2018 and Wave 2 (post-implementation) was in late November 2018. The surveys collected information on frequency of e-cigarette and cigarette use along with reported prices paid for tobacco products. We also interviewed government officials and store owners about the e-cigarette price and policy changes. **Results:** A total of 1,039 participants completed both waves of the survey. As hypothesized, e-cigarette use declined, from 75.9% reporting daily use at Wave 1 to 63.7% at Wave 2 ($p < .001$). Contrary to our hypothesis, combusted cigarette use also declined, from 28.3% daily use at Wave 1 to 24.0% at Wave 2 ($p < .001$). The average price paid for a 60 mL bottle of e-liquid increased 5%, from IDR 124,100 (USD \$8.49) at Wave 1 to IDR 129,800 (USD \$8.88) at Wave 2. A 9% increase was observed comparing purchases with no tax stamp at Wave 1 and those with a stamp at Wave 2. In our interviews, we learned that the tax applied was only 42% of the retail sale price and then the e-cigarette industry and retailers absorbed most of this tax in an attempt to mitigate impacts on sales. **Conclusion:** As implemented, the effective tax rate on Indonesian consumers was far lower than envisioned. The price change appears to have been enough to decrease

e-cigarette use, but it did not significantly impact combustible cigarette use. Additional research is needed to examine the impacts of larger e-cigarette tax increases on tobacco use behaviors.

FUNDING: Nonprofit grant funding entity

POD2-3

DO CIGARETTE SMOKERS EXPERIENCING ECONOMIC HARDSHIP SUBSTITUTE LOWER-PRICED CIGARILLOS OR FILTERED CIGARS FOR CIGARETTES?

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Significance: Although cigarillos and filtered cigars (FCs) are similar to cigarettes, they often cost less in the United States, in part due to differences in state excise taxes. We examine whether this possible price differential may result in the substitution of cigarillos and FCs for cigarettes among cigarette smokers experiencing economic hardship, potentially impeding attempts to quit cigarettes. **Methods:** Data were from the PATH Study Wave 2 (W2) and Wave 3 (W3) Adult Public Use Files. Analyses examined W2 past 30-day cigarette smokers and were stratified by W2 economic hardship defined as unable to pay bills in the past 30 days due to a money shortage or receiving public assistance. Longitudinal weighted multinomial regressions examined associations between economic hardship and a 4-level W3 outcome (attempted to quit cigarettes (ref), continued using cigarettes, substituted cigarillos or FCs and did not attempt to quit, or substituted cigarillos or FCs and attempted to quit). Analyses were adjusted for income and other demographics, marijuana use, and W2 cigarillo or FC use. Preparation of this paper was funded by Westat, Inc. **Results:** Cigarette smokers who newly experienced a money shortage at W3 were 1.73 times more likely to substitute cigarillos and attempt to quit cigarettes than solely attempt to quit cigarettes, relative to those who did not experience a money shortage at either wave (RRR: 1.73, CI: 1.18 - 2.55). Similarly, cigarette smokers who newly experienced a money shortage at W3 were 1.86 times more likely to substitute FCs and attempt to quit cigarettes than solely attempt to quit cigarettes (RRR: 1.86, CI: 1.04 - 3.32). There were no significant associations for public assistance. **Conclusion:** Compared to cigarette smokers who experience no money shortage, cigarette smokers who newly experience a shortage of money were more likely to substitute cigarettes with cigarillos or FCs and attempt to quit rather than solely attempt to quit. Experiencing sustained shortage of money or receiving public assistance were not associated with quit attempts or substituting. Results suggest that price differentials may lead to substitution for people with an immediate money shortage.

FUNDING: Other

POD2-4

IMPACT OF MARK-UP POTENTIAL ON SALES OF HEATED TOBACCO PRODUCTS AND CIGARETTES EVALUATION FROM DIFFERENCES IN EXCISE TAXATION ACROSS COUNTRIES

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Since they were first introduced in Japan in 2014, sales of heated tobacco products (HTPs) have increased rapidly in countries that have launched them. HTPs are close substitutes to cigarettes because, contrary to electronic cigarettes (e-cigs), HTP sticks contain both tobacco and nicotine. Stakeholders have promoted them as reduced-risk products because HTP sticks are heated rather than burned, and therefore produce less harmful chemical substances than what is typically produced in the combustion of cigarette sticks. In most countries HTPs are taxed at much lower excise tax rates than cigarettes, generally resulting from a lack of knowledge regarding optimal taxation of these products, and the fact that there is no evidence on their health effects. On average across 34 countries, the tax burden of HTPs is more than half that of equivalent cigarettes. Yet manufacturers sell HTPs packs at similar prices than equivalent cigarettes packs, in spite of the similar marginal cost of producing them. This results in larger potential returns for producing HTPs than for producing cigarettes. Recent evidence also reveals that, contrary to being perceived as "reduced risk", consumers of HTPs use both products simultaneously rather than using HTPs as a tool for quitting cigarette smoking. This paper collects information on pricing, sales, and tobacco excise taxes across countries over recent years to compute the tax gaps between HTPs and cigarettes and the resulting gaps in potential mark-ups, and to estimate the impact of mark-up potentials on sales. In addition to using tax differentials cross countries as a proxy for mark-up potential, we also employ a synthetic control methodology to evaluate the introduction of HTPs by constructing counterfactuals for countries where HTPs are



sold (e.g., Canada) using countries where HTP sales are not allowed (e.g., the US). We also account for sales of electronic cigarettes (e-cigarettes), which have also been promoted as "reduced-risk", but do not contain tobacco, and for other tobacco regulations.

FUNDING: Academic Institution

POD2-5

THE COSTS OF VAPING - EVIDENCE FROM ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance This study compares the prices paid for nicotine vaping products (NVPs) and supplies among current NVP users to prices paid for cigarettes in Australia (AU), Canada (CA), England (EN), and the United States (US). **Methods** The 2016 International Tobacco Control 4-Country Vaping and Smoking Survey (4CV1) included: (1) self-reported prices paid for rechargeable devices with cartridges and the devices with e-liquids among current NVP users, (2) prices paid for disposable NVPs, cartridges, and e-liquids among current NVP users, and (3) self-reported prices paid for cigarettes among current smokers. We used the comparable unit standard, such that one pack of cigarettes was considered to represent the equivalent level of consumption as one disposable, 3.55mL of e-liquid, or 3.55mL of cartridge, to compute comparable prices of cigarette, disposable, cartridge, and e-liquid. **Results** Relative prices of NVPs with respect to the price of cigarettes in AU were 0.54 for disposables, 0.09 for e-liquid, and 0.43 for cartridges. In CA, the relative prices of NVPs were 1.21, 0.31, and 1.39, respectively. In EN, they were 1.09, 0.15, and 0.72, respectively. In the US, relative prices of NVPs were 1.90, 0.41, and 1.59, respectively. Our results indicated disposable NVP price was higher than the price of a comparable unit for combustible cigarettes in EN, US, and CA. Pre-filled cartridge price was higher than the price of a comparable unit of cigarettes in US and CA, but lower in EN and AU. E-liquid price was consistently lower than the price of a comparable unit of cigarettes across four countries. Price of a rechargeable device is 3-5 times higher than a pack of cigarettes in four countries. **Conclusion** NVP prices were generally higher than prices of combustible cigarettes, especially the high up-front NVP devices. The high up-front costs of purchasing a reusable NVP may discourage some smokers from switching to vaping. However, the average lower costs of cartridges and e-liquids relative to a package of cigarettes makes switching to a NVP an attractive alternative to smoking in the long term so long as smokers switch completely to vaping.

FUNDING: Federal

PAPER SESSION 3: ENHANCING EFFECTIVENESS OF HEALTH WARNING LABELS: INTERNATIONAL PERSPECTIVES

POD3-1

HEALTH WARNING LABEL COMPLIANCE OVER TIME: A 9-COUNTRY STUDY

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Background: The Tobacco Pack Surveillance System (TPackSS) monitors health warning label (HWL) implementation in low- and middle-income countries with a high tobacco burden. HWLs educate the public on the health effects of smoking. Well-designed policies are most effective if implemented as intended. We examined implementation of HWLs in countries that increased health warning label requirements.

Methods: Unique cigarette packs were systematically purchased in at least three cities in nine countries (Bangladesh, Brazil, China, India, Indonesia, Thailand, Russia, Philippines, and Vietnam) in 2013. Cigarettes were purchased again in 2015 (Indonesia, Russia, Thailand, Vietnam), 2016 (Bangladesh, Brazil, India, Philippines), and 2017 (China) following increases in HWL coverage. Cigarettes displaying the current country HWL at the time of purchase were coded for key HWL requirements (coverage, location, text size, and label elements [e.g., text color, presence of borders]) by two independent coders.

Results: In 2013, 1164 cigarette packs were coded in the nine countries. Overall compliance with the key HWL requirements ranged from 17% in Philippines to 90% in China and Russia. 1410 cigarette packs were coded during the second round of data collection; overall compliance ranged from 51% in India to 95% in Russia. In most countries, the coverage requirement had the lowest compliance among all indicators (wave 1, 46-99%; wave 2, 53%-95%). Warning location had the highest compliance across both waves (wave 1, 75-100%; wave 2, all 100%). Warning text size in wave 1 had compliance between 26% and 100%. In wave 2, warning text size had compliance between 88% and 100%. In wave 1, warning label elements had compliance between 80% and 100%. In wave 2, label elements compliance was between 83% and 100%.

Conclusion: Overall compliance with HWLs improved for many of the countries. We find that many cigarette packs in some countries failed to meet the HWL requirements in their country, especially coverage. Evidence suggests that HWL effectiveness increases with their coverage. FCTC article 11 notes that Parties should monitor the tobacco industry's compliance with HWL requirements.

FUNDING: Nonprofit grant funding entity

POD3-2

FRAMING MATTERS: A SYSTEMATIC REVIEW OF THE MODERATED RELATIONSHIP BETWEEN FRAMING AND THE PERCEIVED EFFECTIVENESS OF GRAPHIC HEALTH WARNING LABELS

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Background and Aims: Over the past decade, there has been widespread adoption of Graphic Warning Labels (GWLs) worldwide in an effort to reduce tobacco use. An important component of label structure includes the framing of warning messages. Several recent studies indicate that the relationship between framing and quit intentions are less clear than previously thought. This review provides critical insight into timely policy recommendations for the FDA. The review aims to synthesize evidence, and distinguish under which circumstances, framing may differentially affect perceptions of the effectiveness of GWLs. **Methods:** Articles eligible for this review included those published in online databases by May 2019 identified with search terms from the following categories: gain, loss, framing, graphic, warning, and tobacco. Eligibility criteria followed PICOS guidelines. Included articles must have the full text available to read and written in English in an academic journal. Study inclusion criteria included: any studies of gain and loss framing effects on GWLs whose reported outcomes were at least one of the following: smoking cessation, intention/motivation to quit, or perceived effectiveness of label. Data extraction and qualitative analysis examined framing effects on the above listed outcomes. **Results:** Of the 489 articles identified in the initial search, seventeen articles met eligibility criteria. Per PICOS guidelines, two coders extracted data from each



article including demographics of participants, intervention type, outcomes, and more. Qualitative analysis revealed nicotine dependence, self-efficacy to quit, and perceived health risk independently moderate the relationship between message framing and listed outcomes. For the general population, loss-framed warnings were perceived as more effective than gain-framed warnings. **Conclusions:** Framing of warning labels for cigarette packaging must be thoroughly considered prior to the U.S. Food and Drug Administration (FDA) must issue new rulings on GWLs by March 2020. GWLs should include different message framing to account for context-dependent moderators.

FUNDING: Academic Institution; Other

POD3-3

SMOKERS' RESPONSE TO THE NEWLY IMPLEMENTED KENYAN PICTORIAL HEALTH WARNINGS AND ZAMBIA'S SINGLE-TEXT WARNING: FINDINGS FROM ITC KENYA AND ZAMBIA SURVEYS

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Significance: Health warnings on tobacco packages are the most cost-effective means of educating the public about the dangers of tobacco use. Few studies have assessed the effectiveness of text-only and pictorial health warnings (PHWs) in African countries. This study assesses the impact of the Kenyan PHWs and Zambia's single-text warning on smokers' health warning effectiveness indicators (HWI), and also compares the findings from both countries. **Methods:** Data were drawn from two waves of the ITC Kenya (KE) and Zambia (ZM) Surveys (KE: $N=1,820$, ZM: $N=1,966$) of cohort adult smokers. KE had 13 English & Swahili text warnings in Wave 1 (2012) and at Wave 2 (2018) had 3 PHWs. ZM had only one English single-text warning at both Waves 1 (2012) and 2 (2014). Longitudinal changes in 6 HWI were assessed between the two waves in KE and ZM, i.e., noticing warnings, reading warnings, thinking about health risks, motivation to quit, avoiding warnings, and forgoing a cigarette. Generalized Estimating Equations were used in the analyses. **Results:** PHWs implemented in KE led to a significant change in all 6 HWI between Wave 1 and 2, i.e., noticing ($W1=60.6\%$ vs. $W2=76.9\%$), reading (28% vs. 45.3%), thinking about health risks (27.2% vs 42.4%), thinking about quitting (23.8% vs 38.6%), avoiding warnings (12% vs 30.3%), and forgoing cigarette (19.1% vs 26.7%). While in ZM (single-text warning), all the 6 HWI did not show any significant changes between the two waves. At Wave 2 (post-introduction of 3 PHWs in KE), Kenyan smokers were more likely to report significant stronger effects than Zambian smokers in all 6 HWI, i.e., noticing (KE=76.9% vs ZM=26.2%), reading (45.3% vs 20.8%), thinking about health risks (42.4% vs 26.3%), thinking about quitting (38.6% vs 29.5%), avoiding warnings (30.3% vs 9.8%), and forgoing cigarette (26.7% vs 20.5%). **Conclusions:** The impact of the health warnings on smokers' HWI in Kenya and Zambia is consistent with results obtained in high-income countries, i.e., PHWs are more effective than text warnings. Findings highlight and support current initiatives to introduce PHWs in Zambia and other African countries.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD3-4

A CIGARETTE CONSTITUENT CAMPAIGN'S INFLUENCE ON SMOKING BEHAVIORS: A RANDOMIZED CONTROLLED TRIAL

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Significance: The Food and Drug Administration (FDA) is required to communicate the health risks of toxic chemicals found in cigarette smoke (i.e., constituents) to the public. Few studies have addressed how FDA can effectively communicate about the toxic constituents found in cigarette smoke. This randomized controlled trial examined whether messages about cigarette smoke constituents can influence quit intentions among adult smokers. The messages focused on the harmful effects of constituents in cigarette smoke with graphic images illustrating the health effect and supplemented with text encouraging smokers to quit. **Methods:** 789 US adult cigarette smokers across the US received daily messages through an online platform each morning for 15 days. Participants were randomized to one of three message conditions: 1) cigarette constituent messages (featuring arsenic, ammonia, lead, formaldehyde, and uranium text and images) with FDA source and text about quitting ("engagement" condition), 2) constituent-only messages without source or engagement text, ("constituent-only"

condition) or 3) a control condition with messages about littering cigarette butts. Participants reported on previous-day smoking behaviors and rated their perceptions of the messages. Follow-up surveys were conducted on days 16 and 32. The primary outcome was quit intentions on day 16. Secondary outcome measures included daily smoking behaviors. **Results:** Participants were 61% female, 73% white, and 91% non-Latino. Quit intentions at day 16 increased among both the engagement ($p<0.01$) and constituent-only ($p<0.001$) conditions compared to the control condition. There were no significant differences in daily smoking behaviors by condition. The number of cigarettes smoked per day decreased as participants viewed more messages across conditions. **Conclusions:** Messages about cigarette smoke constituents with or without engagement text and FDA source increased smokers' intentions to quit. These results can inform national efforts to communicate the harmful health effects of constituents in cigarette smoke in ways that motivate smoking cessation among adult smokers.

FUNDING: Federal

POD3-5

ENHANCING ROLL-YOUR-OWN LOOSE TOBACCO PACKAGING WARNING LABELS WITH SELF-EFFICACY AND RESPONSE EFFICACY MESSAGES: A QUALITATIVE EXPLORATION

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Significance: Smoking cessation rates must increase dramatically to achieve New Zealand's (NZ) Smokefree 2025 goal. Currently, NZ's tobacco packaging emphasises health risks and fails to address common beliefs that quitting is "too hard". Ironically, these messages may decrease smokers' confidence in their ability to quit. Among roll-your-own (RYO) smokers, who often experience greater disadvantage and nicotine dependence than tailor-made smokers, the effects may be even more pronounced. We explored NZ RYO smokers' responses to self-efficacy and response efficacy messages printed on the inner face of RYO pouches. **Methods:** We conducted in-depth interviews with 22 RYO smokers. Each participant randomly viewed two life-size, three-dimensional pouch mock-ups, and commented on 1) a self-efficacy design (testimonial-style; image of a smiling woman captioned "Tips from former smokers", with four craving management tips), and 2) a response efficacy design (informational-style; metaphorical image, with short- and long-term physical recovery points after quitting). Transcripts were analysed using qualitative description. **Results:** Both designs elicited positive reactions and were described as novel, informative and engaging. Nearly everyone favourably assessed the self-efficacy design's testimonial-style. Participants drew inspiration and encouragement from the image, and believed it showed an ex-smoker, which made the craving tips more believable and personally relevant. Many participants felt the response efficacy design presented new information, though some thought a testimonial-style presentation would be more impactful. More generally, a few questioned the effectiveness of the tips or the veracity of the recovery timeline, and some felt the messages, while thought provoking, would not alter their behaviour, especially when they craved a cigarette. **Conclusion:** Approaches that address both self-efficacy and response efficacy may help reduce RYO use. In particular, the testimonial-style fostered self-identification and empathy that could motivate and support quit attempts among RYO users. Future research could test these preliminary findings, which could help reduce health inequalities.

FUNDING: Academic Institution

POD3-6

INTEGRATING OBJECTIVE MEASURES OF VISUAL ATTENTION TO IMPROVE MODELS EXAMINING PICTORIAL WARNING LABEL EFFECTS ON CHANGES IN CIGARETTE SMOKING BEHAVIOR

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Significance: Researchers often utilize theoretical models of behavior change to understand how pictorial warning labels (PWLs) affect cigarette smoking behavior. This study examined if including objective measures of visual attention into such models enhances the understanding of PWL effectiveness. **Methods:** 321 non-treatment-seeking adult daily smokers (58.9% male, 54.2% Black, mean [SD] cigarettes per day = 15.2 [7.0]) were randomized to one of nine PWLs (viewed via eye-tracking during laboratory sessions and affixed to packs externally) for a 10-day, parallel-design study. Eye-tracking assessed visual attention (e.g., latency and dwell time) to areas of interest (e.g., image vs. text). Daily cigarette consumption was tracked throughout the study (verified via filter collection) and quitting attitudes, beliefs, intentions, and puffing behavior (e.g., total puff volume) were assessed during laboratory visits. An initial

**PAPER SESSION 4: EVALUATING TOBACCO 21 IMPLEMENTATION**

path model examined associations of baseline quitting attitudes and beliefs (positive and negative) with end-of-study quitting intentions, daily cigarette consumption, and total puff volume; a second model included attention measures as additional baseline predictors. Results: In both models, greater quitting attitudes and positive, but not negative, beliefs were associated with greater quitting intentions (p 's < .001), and greater quitting intentions were associated with significantly lower daily cigarette consumption ($B = -1.12$, $SE = 0.57$) and total puff volume ($B = -63.51$, $SE = 29.43$). Both models fit the data well ($p > .05$, $RMSEA < .05$, $CFI/TLI > .80$). Including attention measures increased explained variance in quitting intentions; shorter image latency and shorter text dwell time were both associated with greater quitting intentions (p 's $\leq .05$). Conclusions: Integrating attention measures into a behavior change model further increases the understanding of PWL effects on intentions and behavior. Findings highlight the value of assessing visual attention in elucidating the mechanisms underlying PWL effectiveness.

FUNDING: Federal

POD4-1**TOBACCO 21 LAWS IN THE US: AN ASSESSMENT OF THE STRENGTH OF STATE LAWS.**

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Significance: Tobacco 21 (T21) policies are aimed at reducing youth access to tobacco products. Over 440 municipalities across the US have implemented T21 laws; further, states are increasingly adopting T21 laws following a surge in e-cigarette use among middle and high schoolers. However, there may be substantial variation in the strength of these laws. This study explores the strength of T21 laws adopted by US states. **Methods:** States with T21 laws were identified using tobacco21.org and tobaccowatcher.org. The laws were retrieved from state legislature websites. Each T21 policy was reviewed and policy provisions were extracted: tobacco products covered, retail licensing authority, enforcement agency and funding, compliance checks, signage, penalties, age verification, and preemption. Law provisions were categorized as strong, medium or weak using T21 best practice guidelines published by tobacco21.org. **Results:** As of August 2019, 18 US states have enacted a T21 law. All laws address e-cigarettes and combustible and smokeless tobacco. Two states do not require retailers to have a license. Fourteen states require retailers to display appropriate signage. Eight states require age verification prior to sale. Laws also stipulate civil penalties to minors ($n=5$) and retailers ($n=10$). Five states require criminal penalties for retailers in violation of the law. Two states designate funding for enforcement. Fifteen states do not preempt local jurisdictions from implementing stronger T21 laws. States with at least four weak provisions include: Arkansas, Illinois, Ohio, Utah, and Virginia. States with at least five best practice provisions include: California, Delaware, Hawaii, Maine, Maryland, Massachusetts, New York and Washington. **Conclusion:** Ten out of 18 T21 laws did not meet best practice guidelines in at least five provisions. Current state T21 laws are deficient in specifying enforcement agency and funding, and requiring compliance checks and age verification. Further research is needed to assess the role and impact that tobacco industry lobbying may have had on the strength of tobacco 21 laws.

FUNDING: Academic Institution

POD4-2**THE CALIFORNIA TOBACCO 21 LAW: DOES IT AFFECT ALL ADOLESCENTS EQUALLY?**

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California's law raising the minimum tobacco purchase age to 21 (T21) went into effect on June 9, 2016. Little is known about how T21 affects tobacco use, nor whether impact varies across disparate groups. Using a quasi-experimental design, we examined changes in tobacco use among adolescents in California pre- and post-T21 law. We also examined whether changes in tobacco use differed across racial minority groups. A statewide sample of 6th through 12th graders ($N=2,078,575$; 51% females) from 4,427 schools in California participated in California Healthy Kids Survey (CHKS) from 2007 to 2018. Participants reported sex, race and grade, and lifetime and past month cigarette smoking and smokeless tobacco use. Controlling for demographics, multilevel mixed effects logistic regression models showed that implementation of T21 law was negatively associated with lifetime ($OR=0.75$, $p<0.001$) and past month ($OR=0.74$, $p<0.001$) cigarette smoking, and with lifetime ($OR=0.73$, $p<0.001$) and past month ($OR=0.67$, $p<0.001$) smokeless tobacco use in the general population. Moderation analyses, however, showed that T21 was associated with greater likelihood of lifetime ($OR=1.06$, $p<0.05$) and past month ($OR=1.27$, $p<0.001$) cigarette smoking and smokeless tobacco use ($OR = 1.15$, $p < 0.01$; $OR=1.22$, $p<0.01$) among African American adolescents relative to others. Greater odds of lifetime ($OR=1.11$, $p<0.05$) and past month ($OR=1.24$, $p<0.001$) smokeless tobacco use and past month cigarette smoking ($OR=1.21$, $p<0.001$) were also observed among Native Hawaiian/Pacific Islander adolescents. In contrast, significant negative interactions between T21 and being American Indian/Alaska Native (AIAN) on lifetime cigarette smoking ($OR=0.90$, $p<0.001$) and lifetime and past month smokeless tobacco use ($OR=0.92$, $p<0.001$; $OR=0.91$, $p<0.001$) indicate that AIAN adolescents may be more responsive to the T21 law. Results suggest that California's T21



contributed to overall reductions in adolescent tobacco use but may differentially impact minority groups. These findings emphasize the importance of understanding potential unintended consequences of this policy to address tobacco-related health disparities.

FUNDING: Federal; State

POD4-3

PREDICTING THE EFFECTS OF TOBACCO 21 LAW ON CIGARETTE USE AMONG YOUTH IN VIRGINIA

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The Tobacco 21 (T21) law passed in February 2019 in Virginia. Raising the minimum age of legal access (MLA) from 18 to 21 years of age is likely to reduce cigarette use among youth. However, scientific evidence remains limited. In this study, we built a system dynamics model to predict the short-term and long term effects of the T21 law on cigarette use among youth in Virginia. Empirical data from the Youth Risk Behavior Surveillance System, Behavioral Risk Factor Surveillance System, Virginia Department of Health, and the American Community Survey were used to calibrate and validate our model. We assessed the trends in the prevalence of cigarette use under the new law, and projected the impact across age groups. The model-predicted prevalence in 2013-2017 closely approximates the historical prevalence, indicating the validity of our simulation model. Our simulations indicated that raising MLA from 18 to 21 could lead to a decrease of 2.24% in the prevalence (N=212,883) of cigarette use among people from 18 to 20 years old in Virginia in 10 years. However, the decrease of cigarette use among youth may not necessarily lead to a lower prevalence of cigarette use in adulthood. The prevalence of adult cigarette use was only 0.58% lower after increasing MLA from 18 to 21 in 10 years. On average, the estimated total cost saved per year is 24 billion US dollars after raising the minimum age of legal access to tobacco products from 18 years to 21 years in Virginia. Our findings suggest that the T21 law is likely to reduce cigarette use among youth in Virginia. However, the preventive effect might be offset in the long run. A package of control measures and efforts, such as strong enforcement, should be implemented for sustainable long-term effect. Funding: Virginia Foundation for Healthy Youth Large Grant (grant #: 8521234)

FUNDING: Nonprofit grant funding entity

POD4-4

E-CIGARETTE AND CIGARETTE PURCHASING BEHAVIOR AMONG ADOLESCENTS AND YOUNG ADULTS BEFORE AND AFTER IMPLEMENTATION OF A STATE-WIDE TOBACCO 21 POLICY

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Significance: Tobacco 21 (T21) laws, which raise the minimum legal tobacco sale age to 21, have been proposed and implemented in states and cities across North America. However, limited data is available on the effect of a T21 law on youth purchasing behaviors and access to tobacco products. **Methods:** Participants in southern California completed questionnaires before (N=1609, Age=18-19) and after (N=1502, Age=19-20) T21 was implemented in California in June 2016. We examined the prevalence of past 30-day cigarette and electronic cigarette (e-cigarette) use, and among past 30-day users, purchase location of tobacco products before vs. after T21. We also examined whether, after T21 was implemented, participants had been refused purchase of tobacco products and the relative ease of cigarette and e-cigarette purchase. **Results:** Past 30-day use of cigarettes increased Pre-T21 (9.6%) to Post-T21 (11.1%), while e-cigarette use decreased (Pre-T21: 12.9%; Post-T21: 9.4%). The majority of past 30-day users purchased cigarettes from gas stations and e-cigarettes from vape shops both before and after T21, although purchase of cigarettes from gas stations significantly decreased Post-T21 (Pre-T21: 44.5%, Post-T21: 32.7%; p<0.05). After T21 implementation, most past 30-day cigarette or e-cigarette users reported that they were not refused purchase of cigarettes (65.4%) or e-cigarettes (82.0%) in the past 30 days, despite being under age 21; only half of participants reported that it was harder to purchase cigarettes (54.3%) and e-cigarettes (43.6%) compared to a year prior to T21 implementation. **Conclusion:** Post-T21, few participants reported refusal of purchase of any tobacco product, de-

spite the illegality of such sales, suggesting that efforts to support enforcement of T21 implementation are critically needed. Surveillance is necessary to determine whether stronger enforcement policies may positively impact the efficacy of T21 legislation.

FUNDING: Federal; State

POD4-5

A MULTILEVEL PROPENSITY SCORE MODEL TO PREDICT U.S. UNDERAGE SALES OF TOBACCO

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Background: Retailer compliance inspection is an important strategy to reduce youth access to tobacco products. Currently, only a small set of tobacco retailers are inspected each year, and the sampling plan may not be optimal. We seek to develop a multilevel propensity score model (PSM) to predict the retail violation rate for underage sale (RVR). Methods: We collected inspection data involving minors on tobacco retailers in 2015-2017 from the Food and Drug Administration (FDA) compliance check database (n=396,155). The compliance inspection data were linked with tobacco retailer list (n=375,518) and multilevel contextual factors at the zip code level. A logistic regression model with random effects was used to develop the propensity score with socio-economic status (SES), tobacco retailer density, past inspection records, smoking prevalence, and tobacco control policies as predictors. Results: Overall 44.4% U.S. zip codes had no compliance inspections, 11.0% with 1 inspection, 13.5% with 2-3 inspections, 15.3% with 4-9 inspection, and 15.9% with 10+ inspections in 2017. The multilevel PSM shows that the number of compliance inspections (AOR=0.90, CI [0.88-0.91]) and the number of retail violations (AOR =1.84, 95% CI [1.67-2.03]) at the zip code level, along with neighborhood socio-demographic characteristics (e.g., urbanicity, race/ethnicity, age distribution, and education level), smoking prevalence at the county level, and tobacco control policies (e.g., cigarette tax, smoke-free laws) at the state level, were significantly associated with future RVR. The PSM shows a good rank order of RVR with the top decile having over 3 times higher of RVR than the lowest decile. Conclusions: The multilevel PSM may be useful to identify hot spots for retail violations of underage sales and inform optimal sampling strategies for compliance inspections. FUNDING: This study is funded by the National Cancer Institute and FDA Center for Tobacco Products (CTP).

FUNDING: Federal; E-cigarette/Alternative nicotine products Industry

POD4-6

UNDERUTILIZATION OF NO-TOBACCO-SALE ORDERS AGAINST RETAILERS THAT REPEATEDLY SELL TO MINORS, 2015-2019

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INTRODUCTION: The FDA conducts inspections at thousands of tobacco retailers each year. Retailers that accrue five violations within 36 months can be subject to a No-Tobacco-Sale Order (NTSO), preventing the establishment from selling tobacco products for a given amount of time. We analyzed the efficacy of the FDA's issuance of NTSOs. **METHODS:** We conducted a quantitative content analysis of FDA's enforcement actions for inspections decided between Oct. 1, 2015, and Mar. 29, 2019. From the 536,134 inspection records, we identified 148 NTSOs and 249,720 unique retailer locations of which 2,095 had three or more violations. Following a power analysis, we randomly sampled NTSOs (n=76) and retail locations (n=152) with frequent violations. With a coding protocol and independent coders, we established high interrater reliability. Using sampling weights, we calculated the proportion of NTSOs that could have been issued earlier and how much earlier they could have been issued. We separately calculated the proportions of frequently-violating locations issued a NTSO and that could have been issued a NTSO. **RESULTS:** Among the FDA's NTSOs, 95% (95% CI: 90%-97%) of NTSOs could have been issued earlier. On average, when an NTSO could have been issued earlier, it could have been issued 428 days earlier (95% CI: 390-465; range: 89-1159) at the fifth violation. Among frequently-violating retail locations, the average number of violations was 5.7 (95% CI: 5.4-5.9). Among these retail locations, 69.7% (95% CI: 62.2%-76.3%) were eligible for a NTSO. Of those eligible, 1.9% (95% CI: 0.5%-7.0%) had received an NTSO. **DISCUSSION:** While the FDA has recently been making news for its enforcement efforts, these results demonstrate that the agency has been reluctant to use its most severe penalty. When it has issued NTSOs, the FDA has allowed retailers more violations than the law requires before finally placing a temporary halt on tobacco sales. These results partially contradict the FDA's narrative that it has been cracking down on sales to minors. While the agency has been active, it has failed to escalate its penalties in the most stringent way possible.

**PAPER SESSION 5: ADVANCEMENTS IN CESSATION STRATEGIES****POD5-001****A MULTICENTER, DOUBLE-BLIND, RANDOMIZED, PLACEBO-CONTROLLED PHASE 2B TRIAL OF CYTISINICLINE IN ADULT SMOKERS - LEADING TO A SIMPLIFIED SCHEDULE FOR PHASE 3 TRIAL DESIGN**

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Background: (-)-Cytisine, is a naturally occurring plant-based alkaloid isolated from seeds of *Cytisus laburnum* and marketed as a smoking cessation drug in Central and Eastern Europe. Studies have shown that cytisinicline (US generic name for cytisine) is effective in helping smokers stop, using a 25-day gradual reduction titration schedule. The Phase 2b trial compared this titration schedule vs a simplified 3 dose/day (tid) schedule as well as 1.5 mg vs 3.0 mg doses. **Methods:** This was a six-arm, randomized, placebo-controlled study conducted in adult smokers (10+ cigarettes daily) willing to set a quit date within 5-7 days of randomization. Subjects were randomized 2:1 to cytisinicline (1.5 mg or 3.0 mg) or placebo. All subjects received behavioral support. Subjects received 25 days treatment using either the reduction titration or tid schedule. The study was blinded to dose but not to administration schedule, conducted in 8 US centers, and evaluated overall reduction in smoking during the 25-day treatment by self-reported daily cigarette counts. Smoking abstinence was confirmed by carbon monoxide (CO) at Week 4 (end of treatment; EOT) and Weeks 5, 6, 7 and 8. Safety and other efficacy comparisons were assessed. **Results:** 254 smokers were randomized. All cytisinicline arms showed a greater reduction in cigarettes smoked within days of starting treatment. Despite the study not being powered to compare quit rates, CO-verified EOT, and prolonged abstinence (off-treatment, weeks 5 to 8) quit rates were significantly greater than those on placebo. For 3 mg tid, these were 54% and 30% respectively compared with 16% and 8% on placebo (Odds Ratios of 6.0 and 5.4). Cytisinicline (3mg tid) was well tolerated, with no AE's reported by more than 6% (nausea, insomnia, abnormal dreams), vs placebo at 10%, 2%, 2%, respectively. **Conclusions:** All cytisinicline dosing schedules led to clinically-relevant quit rates. The 3 mg tid group had slightly better abstinence rates than the other groups; had high treatment compliance (97.6%); and an adverse event frequency comparable to placebo. The simplified 3 mg tid dosing schedule for cytisinicline will be evaluated in phase 3 studies. The authors would like to thank the participating investigators, clinical staff and study subjects for their contributions.

FUNDING: Pharmaceutical Industry

POD5-2**PRACTICE QUIT ATTEMPTS: SCOPING REVIEW OF A NOVEL INTERVENTION STRATEGY**

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Significance: Practice quit attempts (i.e., attempting to not smoke for a few hours or days, without pressure to permanently quit) represent a potentially novel intervention target, particularly for smokers who are unmotivated or ambivalent regarding permanent cessation. However, little is known about the process and efficacy of interventions designed to foster practice quitting. We conducted a scoping review to: 1) clarify operational definitions of 'practice quit attempts,' and 2) identify empirical findings on smoking characteristics and outcomes associated with practice quit attempt interventions. **Methods:** We conducted a systematic literature search of Pubmed, Scopus, Google Scholar, CINAHL (Cumulative Index of Nursing and Allied Health Literature), PsycINFO, and the Cochrane library databases, supplemented by manual search of reference lists of pertinent papers. Using pre-established eligibility criteria, we identified behavioral or pharmacological intervention studies that explicitly targeted practice quitting behavior among adult cigarette smokers. The initial search yielded 3146 articles, and the full-text review was narrowed to 47 articles, 22 of which were deemed relevant. **Results:** Included studies defined practice quit attempts as temporary/ trial abstinence, nicotine withdrawal exposures, or behavioral experiments/ challenges to meet brief non-smoking goals. Practice quit attempts were fostered by an array of intervention techniques, including medication sampling, preparation/ pre-cessation counseling, behavioral shaping/ coping

skills training, and digital health interventions. Interventions were tested in a range of treatment contexts, from those that were universal in reach to those targeting specific populations (e.g., pre-surgical, addiction treatment, or secondhand smoke reduction contexts). Several trials demonstrated efficacy on quit attempt and downstream cessation outcomes. **Conclusions:** Further large-scale research on practice quit attempts is needed. If initial findings are confirmed, fostering practice quit attempts through behavioral or pharmacological intervention offers a promising, novel technique for cessation induction.

FUNDING: Federal

POD5-3**AXS-05 (DEXTROMETHORPHAN AND BUPROPION) ASSOCIATED WITH GREATER REDUCTION IN SMOKING THAN BUPROPION**

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Significance: Dextromethorphan is an N-methyl-D-aspartate (NMDA) receptor antagonist, an alpha-3 beta-4 nicotine acetylcholine receptor antagonist, and acts on other sites to elevate synaptic levels of dopamine, norepinephrine, and serotonin. Dextromethorphan is rapidly metabolized by CYP2D6 into dextropropranolol, which has no known effect on smoking. Bupropion is an FDA-approved smoking cessation medication and is a potent CYP2D6 inhibitor. AXS-05 is combination dextromethorphan-bupropion and provides sustained elevations of plasma dextromethorphan because bupropion inhibits dextromethorphan metabolism. **Methods:** Duke University partnered with Axsome Therapeutics, Inc. to conduct a Phase 2 double-blind, randomized, active-controlled trial comparing twice daily AXS-05 (dextromethorphan IR 45 mg + bupropion SR 105 mg) to twice daily bupropion SR 105 mg. Fifty-eight daily smokers were randomized to treatment with AXS-05 or bupropion for three weeks without instructions to change their smoking. The primary outcome was change in ad libitum smoking during this 3-week period via daily self-report, and weekly cotinine and carbon monoxide (CO) breath testing. **Results:** There were no significant baseline differences between groups. Both medications were well tolerated with minimal side effects and high adherence. Over the 3-week period the AXS-05 arm showed a decrease of 8.49 cigarettes per day (SE = 0.37) vs. the bupropion arm with a decrease of 6.79 cigarettes per day (SE = 0.39), $p = .0016$ (Cohen's $d = 0.85$, large effect size). In the AXS-05 arm, correlation of CO and cigarettes per day was $r = 0.63$ ($p < 0.001$); correlation of CO and cotinine was $r = 0.54$ ($p < 0.001$). Adherence vs. non-adherence with AXS-05 use was associated with smoking 2.88 fewer cigarettes on the day of medication use ($p < 0.001$). Daily adherence to bupropion use was not associated with daily smoking reduction. **Conclusion:** AXS-05 appeared to be associated with a greater reduction of ad libitum smoking when compared to its constituent dose of bupropion. Results suggest the need for additional research to assess the effect of AXS-05 on smoking abstinence.

FUNDING: Pharmaceutical Industry

POD5-4**OLDER ADULT SMOKERS: DO THEY ENGAGE WITH AND BENEFIT FROM WEB-BASED SMOKING CESSATION INTERVENTIONS?**

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Significance: Older adults (OA; age 60+) comprise over 12% of all US adult smokers and will likely be an even higher fraction of all smokers as the population of OA is projected to double over the next 40 years. Their smoking quit rates are comparable to those of younger smokers. But OA face major barriers to receiving cessation services, including provider biases about OA not wanting to quit smoking or not being able to change their smoking habits at a later stage in life. Self-help web-based cessation interventions may help address provider access barriers but a commonly-held view is that OA lack the skills, confidence, and desire to use e-health technologies. Thus, the purpose of this study was to explore OAs' (1) level of engagement with a web-based smoking cessation intervention, as compared to middle-aged and younger adults, (2) level of engagement as predictive of smoking cessation, and (3) cessation rates, as compared to middle and younger adults. **Methods:** Secondary analysis of a large RCT (N=2637) of two web-based interventions for smoking cessation. Participants were divided into age cohorts consistent with previous literature: young adults (YA; n=890/2637; age=18-39), middle-aged adults (MA; n=1308/2637; age=40-59), and OA (n=439/2637; age=60+). Baseline characteristics, login data, and complete-case self-reported 30-day point prevalence abstinence at 12 months post randomization were collected (88% 12-month data retention). **Results:** OA had a greater mean number of logins to their assigned website than YA (7.7 vs. 4.9; IRR: 1.58; 95% CI: 1.38, 1.80; $p < 0.001$) and a similar number of logins as MA (7.7 vs. 8.5; IRR: 0.91; 95% CI: 0.80,



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1.03; $p=0.145$). For OA, each login predicted a 2% higher likelihood of quitting smoking (OA: $n=94$; IRR: 1.02; 95% CI: 1.00, 1.03; $p<0.05$). OA quit smoking at the same rate as MA and YA (OA=24%; MA=24%; YA=27%; $p=0.905$). **Conclusion:** When reached with web-delivered interventions for smoking cessation, OA utilize them as much as (or even more than) younger smokers and quit smoking at the same rate as younger smokers. These results challenge the view that OA would not use or benefit from web-delivered cessation interventions.

FUNDING: Federal; Academic Institution

POD5-5

MULTI-CENTER RANDOMIZED CONTROLLED NON-INFERIORITY TRIAL OF CLINICAL EFFICACY COMPARED TELEMEDICINE VS FACE-TO-FACE VISITS FOR SMOKING CESSATION

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Background: Smoking is a big public health concern globally. A 12-week standardised smoking cessation program is available in Japan; however, it requires face-to-face clinic visits, which has been one of the key obstacles for the targeted population to complete the program, resulting in a low smoking cessation success rate. Telemedicine using internet-based video counseling instead of regular clinic visits could be help to solve this issue. Objective: This study aimed to evaluate the efficacy and feasibility of an internet-based remote smoking cessation support program compared with the standard face-to-face clinical visit program among patients with nicotine dependence. Methods: This study was a randomized, controlled, open-label, multicenter, non-inferiority trial. We recruited nicotine-dependent adults from March to June 2018. Participants randomized to the telemedicine arm received internet-based video counseling, whereas control participants received standard face-to-face clinic visits at each time point in the smoking cessation program. Both groups received a CureApp Smoking Cessation smartphone app with a mobile exhaled carbon monoxide checker. The primary outcome was a continuous abstinence rate (CAR) from weeks 9 to 12. Results: We randomized 115 participants with nicotine dependence: 58 were allocated to the telemedicine (internet-based video counseling) group and 57, to the control (standard face-to-face clinical visit) group. We analyzed all 115 participants for the primary outcome. Both telemedicine and control groups had similar CARs from weeks 9 to 12 (81.0% vs 78.9%; absolute difference, 2.1%; 95% CI -12.8 to 17.0), and the lower limit of the difference between groups (-12.8%) was greater than the prespecified limit (-15%). Conclusions: The application of telemedicine using internet-based video counseling as a smoking cessation program had a similar CAR from weeks 9 to 12 as that of the standard face-to-face clinical visit program. The efficacy of the telemedicine-based smoking cessation program was not inferior to that of the standard visit-based smoking cessation program.

FUNDING: Other



PODIUM PRESENTATION 2

PAPER SESSION 6: EVALUATING NATIONAL TOBACCO CONTROL MASS MEDIA CAMPAIGNS

POD6-1

COMPARISON OF FLAVOR CHEMICALS AND CYTOTOXICITY OF AUTHENTIC AND COUNTERFEIT REFILL FLUIDS PURCHASED WORLDWIDE

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Electronic cigarettes (ECs) expose consumers to nicotine, flavor chemicals, metals and reaction products that can negatively impact the health of users. Recently, the use of ECs has been linked to e-cigarette, or vaping, product use associated Injury (EVALI). To examine the relationship between flavor chemicals and VAPI, we identified and quantified flavor chemicals and nicotine in EC products that were manufactured by one company and purchased in four countries, and we compared flavor chemicals in authentic and counterfeit products. We identified cytotoxic refill fluids using the MTT assay and further observed their effects on cell growth using live cell imaging. We then tested authentic standards of pure flavor chemicals that may contribute to the cytotoxicity of the refill fluids. Total flavor chemical concentration was = 1 mg/ml in 76% of the refill fluids and = 10 mg/ml in 34%. Of 130 flavor chemicals identified, 28 were = 1 mg/ml in at least one sample and 6 of these were = 10 mg/ml. The total number of flavor chemicals in each product ranged from 0 – 50. For authentic refill fluids, products purchased in different countries were similar in type and concentration of flavor chemicals. However, counterfeit "Menthol" and "Bright Tobacco" products contained twice the concentration of flavor chemicals as their authentic counterparts. Identical products purchased in different countries induced similar cytotoxic responses in the MTT assay and cell growth inhibition in the live cell imaging assay. However, counterfeit "Bright Tobacco" inhibited cell growth more than its authentic counterparts. Ethyl maltol, furaneol, and eugenol contributed to toxicity. Except for counterfeit products, cytotoxicity did not vary with country of origin. Cytotoxicity was attributed to specific flavor chemicals that were present in high concentration, which often exceeded those in other consumer products. Flavor chemical concentrations in counterfeit products exceeded those in their authentic counterparts, supporting the idea that counterfeit products can contribute to EVALI. Safety of these products could be improved by regulation of their flavor chemicals.

FUNDING: Federal

POD6-2

A MACHINE LEARNING APPROACH FOR CATEGORIZATION OF FLAVORED E-LIQUIDS BASED ON FLAVOR INGREDIENT COMPOSITION

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Significance: Flavors increase e-cigarette appeal and may stimulate use among vulnerable groups such as non-smoking adolescents. Regulators should monitor the market to gain insight in, and regulate the range of available e-liquid flavors. A comprehensive analysis of Web shops for available e-liquids and flavors is highly time-consuming and challenging due to the market's dynamic character. We recently used data from manufacturers on the Dutch market to manually classifying e-liquids into 16 flavor categories. However, 2,586 e-liquids could not be classified due to insufficient flavor-related information. To accelerate classification, and to make it less dependent on vague flavor-related information, we aimed to automate the process by predicting e-liquids' flavor categories based on their flavoring compositions. Methods: A dataset from manufacturers containing 16,839 e-liquids and their ingredients was used. E-liquids were previously classified based on flavor-related information into 16 categories of the e-liquid flavor wheel. Quantitative and qualitative ingredient data were used to predict e-liquid flavor categories using a random forest machine-learning algorithm. Results: Using data on ingredient quantities, 9,982 of 14,253 e-liquids (70%) were assigned to the correct flavor category. For 3,740 incorrectly assigned products (26% of total e-liquid sample), the correct category received the second highest number of votes. The overall prediction accuracy was 66% when using qualitative data. All e-liquids that could not be classified manually were assigned to a flavor category by the algorithm. Conclusions: Applying a machine-learning algorithm to a dataset of e-liquid flavoring compositions can provide a quick and reliable estimation of marketed e-liquid flavors and their distribution across

categories, even when only qualitative ingredient information is used. We recommend other jurisdictions to request similar datasets and/or perform similar analyses, to facilitate comparative analyses between regions and countries. If information from manufacturers is unavailable, chemical-analytical data can be used as well.

FUNDING: Federal

POD6-3

TOBACCO FLAVORS ALTER MIDBRAIN NEURONS AND CONTRIBUTE TO ADDICTION-RELATED BEHAVIOR

Brandon J. Henderson, PhD. Marshall University, WV.

Significance: When comparing combustible and electronic cigarettes only one flavor is allowed with combustible cigarettes (menthol) while >7000 are available for electronic nicotine delivery systems (ENDS). With the growing number of users of ENDS there is an increased need to understand how flavor additives alter behavior related to reward and reinforcement. This is especially true given that there is a growing number of ENDS users preferring zero-nicotine flavored e-liquids. Methods: We used conditioned place preference (CPP) and vapor self-administration assays with adult mice (3 – 5 months old, male and female) to study how flavors alter reward- and reinforcement-related behaviors. Whole-cell electrophysiology and fluorescence microscopy were used to examine how ventral tegmental area (VTA) dopamine and GABA neurons are altered in mice that completed behavioral tasks. Results: Menthol and two green apple flavorants (farnesol and farnesene) enhanced nicotine reward-related behavior in a CPP assay. Alone, farnesene and farnesol both produced reward-related behavior in CPP assays. In e-Vape self-administration assays, we observed that flavors (menthol and green apple) enhanced escalation of self-administration behavior. To determine how flavorants alter nicotinic receptors to produce reward-related behavior, we used electrophysiology and fluorescence microscopy. In electrophysiology assays, we observed an enhancement of VTA firing frequency in mice in the flavor + nicotine behavioral groups compared to nicotine alone. Alone, green apple flavorants stimulated elevations of dopamine neuron firing frequency and a decrease in GABA neuron firing. Furthermore, farnesene was found to stimulate $\alpha 6\beta 2\beta 3$ and $\alpha 4\beta 2$ nicotinic acetylcholine receptor (nAChR) activation. In comparison, farnesol and menthol failed to stimulate nAChRs in a manner that matches farnesene's effect. Conclusions: Tobacco flavors cause direct changes in VTA dopamine and GABA neurons. Given their importance in the reward pathway, further studies are necessary to increase our understanding of how e-liquid flavors alter vaping behavior.

POD6-4

FLAVORS: CONDITIONED REINFORCERS INTERACT WITH SELF-ADMINISTERED NICOTINE IN RATS

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Background: Most flavor additives in tobacco and electronic nicotine delivery systems (ENDS) are conditioned reinforcers (CRs) – their value derives from experience. We and others have found that nicotine (NIC) potently interacts with CRs by enhancing their motivational value. Objective: The goal of the present studies was to manipulate the value of flavor additives to investigate whether they interact with NIC to increase self-administration and motivation. Method: Rats were randomly assigned to one of two flavor conditions (CR or Neutral); the CR groups received access to menthol (320 μ M) or licorice root extract (1% v/v) in sucrose (20% w/v) for 1 h per day for 24 days. The Neutral group received access to licorice or menthol in tap water. During subsequent iv NIC self-administration rats had access to two sipper tubes connected to lickometers to record contacts. For all rats, meeting the schedule of reinforcement on the active sipper tube resulted in iv NIC (0, 7.5, 20, or 40 μ g/kg/infusion, n=5-6/group/dose) and 0.12 ml aliquots of unsweetened licorice or menthol in the sipper tube. Responses on the inactive sipper tube resulted in 0.12 ml aliquots of water. After operant testing, microdialysis samples were collected from the shell of the nucleus accumbens (NAc) during exposure to iv NIC and the oral flavor. Results: Neutral flavor additives had no effect on iv NIC self-administration – Neutral flavors were only self-administered at NIC doses that are known to support operant responding alone (20-40 μ g/kg/infusion). The flavor CR shifted the dose-response to the left, robust self-administration was observed at the lowest NIC dose (7.5 μ g/kg/infusion). The flavor CR also increased motivation to obtain NIC, relative to the neutral flavor. Finally, we observed no changes in extracellular DA in the NAc shell when iv NIC was presented with the neutral flavor, but robust increases when



NIC was presented with the flavor CR. Conclusion: NIC can potentially interact with flavor CRs to promote greater NIC self-administration and increase motivation. This increase in motivation is associated with increases in extracellular DA in the NAC.

FUNDING: Federal

PAPER SESSION 7: EVALUATING NATIONAL TOBACCO CONTROL MASS MEDIA CAMPAIGNS

POD7-1

CHANGES IN KNOWLEDGE, ATTITUDES, AND BELIEFS AMONG RURAL BOYS IN THE REAL COST - SMOKELESS CAMPAIGN EVALUATION

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Background: The U.S. Food and Drug Administration (FDA) developed a multi-strategy youth-targeted public education campaign to reduce the burden of tobacco, including a rural smokeless tobacco (SLT) prevention campaign, *The Real Cost - Smokeless*. An objective of the campaign was to change SLT related knowledge, attitudes, and beliefs (KABs) of its target audience. The campaign targeted 12 to 17 year old boys in 35 predominantly rural Designated Market Areas (DMAs) across the United States. In this study, we present our findings showing changes in KABs among rural boys. **Methods:** The evaluation team conducted a randomized field trial in 30 rural DMAs in the U.S. with 15 treatment markets and 15 control markets. We surveyed a longitudinal cohort of 2,168 male youth aged 11 to 16 years at baseline from January 2016 through December 2018. We designed pre/post difference in difference multivariate regression models to compare changes in KABs for respondents in intervention markets to control markets. We controlled for SLT use and susceptibility, age, race, parent education, household income, media use, and other environmental factors. **Results:** At final follow-up, agreement with 1 of 10 campaign targeted KABs increased significantly in the intervention markets compared to control markets (SLT use will shorten my life; 4 percentage points (pp), $p=0.032$). Agreement also increased significantly for three KABs among youth who were 15 years old or older at baseline in our sample. Their agreement to: if I use SLT, I will... (1) damage my body (5pp; $p=0.045$), (2) be unable to stop (10pp; $p=0.015$), and (3) develop gum disease (6pp; $p=0.025$) increased significantly in campaign targeted DMAs compared to control markets. Agreement did not increase significantly in any of the seven KABs that we measured that were not included in the campaign messaging. **Conclusion:** The campaign was successful in changing targeted KABs, especially for youth who were 15 years old and older. Based on prior literature showing the predictive relationship between KABs and longer-term behavior change, these findings suggest that the campaign could have an effect on SLT use among rural boys.

FUNDING: Federal

POD7-2

THIS FREE LIFE CAMPAIGN, INVESTIGATING CAMPAIGN ENGAGEMENT AND INTENTIONS TO QUIT AMONG LGBT YOUNG ADULT NONDAILY SMOKERS

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Significance: LGBT young adults smoke at disproportionately higher rates than their non-LGBT counterparts, but prevention efforts are limited. This study evaluates a local Minnesota partnership extension of the Food and Drug Administration Center for Tobacco Products' This Free Life (TFL), a Social Branding® public education campaign, that aims to prevent and reduce tobacco use among LGBT young adults who occasionally smoke. The intervention features events at LGBT bars and clubs in the Minneapolis area, local LGBT influencers, and tailored and targeted social and digital media. **Methods:** In an independent evaluation funded by Blue Cross Blue Shield of MN, cross-sectional surveys ($n=791$) were collected from LGBT young adult (18-24) nondaily smokers online via social media and in-person at LGBT social venues at three timepoints between 2016-2018. **Results:** We examined the relationship between campaign engagement and intention to quit as mediated by attitudes against smoking, perceived normative trends and perceived behavioral control, controlling for demographics. 42.7% reported exposure to the campaign, and 71.3% of those also engaged with TFL. Overall, greater campaign engagement was associated with increased intentions to quit through attitudes against smoking and perceived normative trends. Attitudes against smoking were a significant mediator between campaign engagement and intentions to quit; attitudes included identifying reducing tobacco use in the LGBT community as a priority, that tobacco use conflicts with personal freedom, and the health consequences make life



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difficult. Perceptions of decreasing tobacco use in the LGBT community were also a significant mediator between campaign engagement and intentions to quit. Perceived behavioral control, belief in one's ability to quit smoking, was not a significant mediator of campaign engagement and quit intentions. **Conclusion:** Results show the campaign has promise to increase intentions to quit among LGBT young adult nondaily smokers by shifting attitudes against smoking and normative trend perceptions. The national TFL campaign is being tracked in a separate, ongoing evaluation.

FUNDING: Federal; Other

POD7-3

CDC'S 2018 TIPS@CAMPAIGN: RESULTS FROM ROUGH CUT TESTING OF TELEVISION ADVERTISEMENTS AMONG ADULT CIGARETTE SMOKERS

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SIGNIFICANCE: Since 2012, the Centers for Disease Control and Prevention (CDC) has aired television ads featuring former smokers who are living with serious long-term health effects from smoking. These ads encourage smokers to quit as part of the *Tips From Former Smokers*® (*Tips*®) campaign. The 2018 *Tips* campaign aired for 25 weeks from April 23 to October 14, 2018. In 2017, CDC tested rough cut advertisements to be aired during the 2018 campaign media buy. Rough cut testing evaluates participants' reactions to near final versions of ads to ensure they are clear, credible, believable, and persuasive. **METHODS:** CDC conducted formative evaluations of six *Tips* ads (*Now You Know*; *Treadmill*; *Oral Cancer*; *Smoker*; *Ways To Quit-1-800*; *Ways To Quit-NRT*) featuring a range of smoking-related health conditions (e.g., lung cancer, oral cancer, and throat cancer) using a convenience sample (n= 5,360) of adult smokers and non-smokers who were online panelists. Smokers (n= 2,681) completed an online survey that assessed message comprehension, perceived effectiveness (PE; the average of a five-point scale of six positive ad reactions), believability, confusion, and whether the ad motivated them to quit smoking. Smokers' assessments of PE are good predictors of intentions to quit and behavior change, and should be tested when developing ads. **RESULTS:** Among smokers, PE scores for all ads were above 3.93 (on a scale of 1 to 5), with Brian's *Now You Know* ad and Sharon's *Treadmill* ad receiving the highest scores (4.06 for each ad). Across all ads, 76% of smokers found all the ads believable, and 73% reported that the ads made them want to quit smoking. Among smokers, 74% reported that Sharon and Tiffany's *Ways to Quit* ad with the nicotine replacement therapy call-to-action message made them want to quit. Over 67% of smokers reported that the two ads featuring Christine (*Oral Cancer Effects* and *Smoker*) made them want to quit so that they could avoid the negative health consequences caused by smoking. **CONCLUSION:** The 2018 *Tips* ads scored high on perceived effectiveness measures, and most smokers reported that the ads were effective at motivating them to want to quit.

FUNDING: Federal

POD7-4

THE IMPACT ON QUITLINE CALL VOLUME OF ADDING AN OFFER OF FREE CESSATION MEDICATION TO NATIONAL ANTISMOKING ADVERTISEMENTS

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SIGNIFICANCE Understanding the marginal impact of adding an offer of free nicotine replacement therapy (NRT) to antismoking ads can inform campaign planning and help quitlines adjust their capacity. As part of the 2017 and 2018 *Tips From Former Smokers* (*Tips*®) campaigns, CDC added brief messages to existing *Tips* ads to inform viewers that they could obtain help getting free NRT by calling 1-800-QUIT-NOW. This study quantifies the size of the quitline call volume increase that can be attributed specifically to the addition of the NRT tag. **METHODS** The NRT-tagged messages were included in *Tips* TV ads for 3 weeks in 2017 and 4 weeks in 2018. A multivariable linear regression model estimated weekly calls to 1-800-QUIT-NOW from all U.S. states as a function of potential exposure to *Tips* television advertisements, measured by weekly media market-level gross rating points (GRPs). We included an interaction term to quantify the size of the impact of adding the NRT message to *Tips* TV ads beyond the overall *Tips* effect on calls. Our model controlled for media market characteristics and included a linear weekly time trend and fixed effects for calendar quarter and state. **RESULTS** Our model estimates that 85,339 of the approximately 168,000 calls to 1-800-QUIT-NOW during the seven weeks in 2017 and 2018 were attributable specifically to the

NRT-tagged *Tips* ads ($p < 0.001$). Had *Tips* TV ads aired during those seven weeks not included the brief offer of NRT, those ads would have been associated with 46,588 additional calls to 1-800-QUIT-NOW ($p < 0.001$). Thus, the addition of the NRT tag accounted for an estimated 83% increase in calls, compared to what calls would have been without the NRT tag in the *Tips* ads. **CONCLUSION** Adding a brief offer of NRT to existing antismoking media campaigns may further increase quitline calls, which could lead to more tobacco users receiving evidence-based cessation treatments from quitlines. This information also may help quitline providers anticipate periods of high demand and adjust their capacity accordingly.

FUNDING: Federal

POD7-5

EXPOSURE TO SMOKE-FREE LAWS AND TELEVISED ANTI-TOBACCO MEDIA CAMPAIGN ADS AMONG SEXUAL MINORITIES COMPARED TO THE GENERAL POPULATION

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SIGNIFICANCE: Sexual minorities (i.e., lesbian, gay, and bisexual individuals) are more likely to smoke compared to heterosexual individuals. This study examined whether sexual minority (SM) adults live in areas with differential exposure to tobacco control media and smoke-free policies, compared to the entire U.S. population. **METHODS:** We used two national datasets to classify exposures to tobacco control policies: county-level Census data on same-sex couple households (2010-2017) and individual-level data from the National Health Interview Survey (NHIS) on sexual orientation (2013-2017). Using both datasets enabled comparisons between strategies for measuring area-based policy exposures among SM individuals. We combined information on SM populations with county-level variables representing the proportion of individuals in each county covered by smoke-free laws in workplaces and hospitality venues (restaurants and bars) (2010-2017), and average 12-month exposure to gross rating points (GRPs) associated with state-sponsored and CDC-sponsored anti-tobacco television campaign ads (2010-2015). We measured exposure to each type of smoke-free law and media campaign among SM adults and the entire U.S. population. **RESULTS:** In Census and NHIS data, SM populations lived in areas with higher levels of exposure to smoke-free law coverage compared to the general U.S. population for both workplaces (Census: 69% vs. 66%; NHIS: 72% vs. 68%) and hospitality venues (Census: 81% vs. 76%; NHIS: 81% vs. 77%). SM populations were exposed to slightly higher levels of state-sponsored television campaign ads compared to the general population in Census data; this differential was less pronounced in NHIS data (Census: 38.7 vs. 35.5 GRPs; NHIS: 35.2 vs. 34.1 GRPs). GRPs for CDC-sponsored campaigns were comparable across populations in both datasets. **CONCLUSIONS:** Our study suggests that SM adults may live in areas with higher levels of exposure to smoke-free laws and anti-tobacco television campaigns compared to the U.S. population as a whole. Additional research is needed to understand whether these policies are equally effective in reducing smoking across all sexual orientation groups.

FUNDING: Federal

POD7-6

EVALUATION OF THE LONDON SMOKING CESSATION TRANSFORMATION PROGRAMME. A TIME SERIES ANALYSIS

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Significance: In 2017, a citywide smoking cessation campaign - the London Smoking Cessation Transformation Programme - was launched in London to boost quitting rates. The campaign involved use of mass media and online marketing, an online portal and a dedicated telephone helpline. This study examined whether the campaign resulted in an increase in quit attempts and in the success rate among smokers who tried to quit in the first year of operation. **Methods:** The programme began in September 2017. We used data from 55,528 past-year adult smokers who participated in a monthly series of nationally-representative cross-sectional surveys in England between 11/2006 and 08/2018. 12.5% of smokers lived in London (intervention region) and 87.5% lived in the rest of England (control region). Interrupted time-series analyses, using Autoregressive Integrated Moving Average (ARIMA) and Generalised Additive Models (GAM), modelled population trends in the difference between monthly quit attempts and quit success rates among smokers who made a quit attempt in London versus the rest of England before and during the first year of the programme. Data were weighted to match the

**PAPER SESSION 8: TARGETING MATTERS:
REDUCING DISPARITIES IN CESSATION****POD8-1****EVALUATING A CULTURALLY-TAILORED SOCIAL MEDIA-BASED
SMOKING CESSATION INTERVENTION FOR SEXUAL AND
GENDER MINORITY YOUNG ADULTS**

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Background: Smoking prevalence is especially high among sexual and gender minority (SGM) individuals. Our group has developed and evaluated a promising social media-based (Facebook) cessation intervention for a general population of young adults. We report the results of pilot work with SGM young adults comparing the original social media intervention with a structurally-identical, culturally-tailored, social media intervention. **Methods:** We pooled data from two pilot studies comparing a SGM culturally-tailored cessation intervention to a non-tailored intervention. Pilot studies procedures were the same, differing only on treatment duration, 90 days or 180 days. SGM young adult smokers (N=302) who varied in readiness to quit smoking were recruited online to participate in a smoking cessation intervention conducted entirely on Facebook. Participants were randomized to receive the tailored or non-tailored intervention using a blocked random assignment sequence. Participants were placed in Facebook groups based on their readiness to quit smoking, with those reporting readiness to quit in the next 30 days placed in "Getting Ready" groups and others placed in "Not Ready" groups. Both the culturally-tailored intervention and the non-tailored intervention took place within "secret" Facebook groups (i.e., entirely private groups) and were structurally identical (i.e., daily Facebook posts by study staff and weekly "The Doctor Is In" live group chat sessions). The content of the tailored intervention reflected characteristics of the target population and relevant SGM tobacco use information. Primary analyses compared the effect of intervention tailoring and duration on outcome variables including biochemically verified abstinence, self-reported point prevalence abstinence, reduction in smoking, and stage of change based on assessments at 3 and 6 months following treatment initiation. Retention rates were over 80 percent. **Results:** There was a significant main effect for intervention tailoring on self-reported abstinence with those in the tailored groups reporting higher abstinence as well as a significant main effect for treatment duration on reduced smoking and making a quit attempt. No differences were found on verified abstinence which may be due to challenges associated with remote biochemical verification. **Conclusions:** This pilot work provides support for the effectiveness of a Facebook smoking cessation intervention tailored to SGM young adults as well as feasibility of extended treatments in a social media setting.

FUNDING: Federal; State

POD8-2**TARGETING MATTERS - DROPOUT, RESPONSE, AND
ABSTINENCE RATES AMONG LATINO SMOKERS ENROLLED IN
SMOKEFREEESP**

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Significance: Latinos' smoking behavior is unique owing to heterogeneity in country of origin, acculturation, and immigration status. Culturally targeted interventions can improve Latinos' cessation outcomes. We examined dropout, response, and abstinence rates among users of 2 free, public text messaging smoking cessation interventions, one targeted at Latinos (SmokefreeEsp) and one general, non-targeted intervention (SmokefreeTXT). **Method:** Participants were 12190 users of SmokefreeTXT (*n* Whites=8395, *n* Latinos=2223) or SmokefreeEsp (*n*=1562). We examined the effect of race and ethnicity among all users and the effect of program (general vs. targeted) among Latinos on response and abstinence rates at quit day, intervention end, and 1-month follow-up adjusting for gender, age, smoking frequency, cigarettes per day, prequit time (0-14 days of preparation time before quit day), and number of quit attempts. We conducted survival analysis of time from quit date to dropout among Whites, Latinos in SmokefreeTXT, and Latinos in SmokefreeEsp. **Results:** Abstinence rates at quit day, intervention end, and 1-month follow-up were 17%, 6%, and 7% for Whites, 7%, 2%, and 2% for Latinos in SmokefreeTXT, and 9%, 3%, and 4% for Latinos in SmokefreeEsp. Whites (Hazard ratio [HR] 1.59, 95% CI 1.43-1.76) and Latinos in SmokefreeTXT (HR

population in England. **Results:** The monthly difference in prevalence of quit attempts in London compared with the rest of England increased by 9.59% (95%CI=4.35-14.83, *p*<0.0001) from a mean of 0.04% pre-intervention to 9.63% post-intervention. The observed increase in success rates among those who tried was not statistically significant (4.72%; 95%CI=-2.68-12.11, *p*=0.21); Bayes factors indicated these data were insensitive. GAM analyses confirmed these results, showing a significant step-level change in the monthly prevalence of quit attempts from pre- to post-intervention that was 1.52 times larger in London than the rest of England (95%CI 1.21-1.91, *p*<0.0001), but no significant difference in change in success of quit attempts (OR=1.22, 95%CI 0.71-2.10, *p*=0.48). **Conclusion:** The promotion of the London Smoking Cessation Transformation Programme during September 2017 was associated with a significant increase in quit attempts compared with the rest of England. This supports the view that media campaigns and cessation support can work together to improve quitting rates in large population groups. The programme could provide a blueprint for similar initiatives in other major cities in the UK or overseas.

FUNDING: Nonprofit grant funding entity



1.40, 95% CI 1.24-1.59) had higher dropout than Latinos in SmokefreeEsp. However, Latinos had lower response (low aOR 0.30, 95% CI 0.21-0.42) and abstinence (low aOR 0.35, 95% CI 0.24-0.50) rates than Whites at all time points. Latinos in SmokefreeEsp (vs SmokefreeTXT) had higher response rates at quit day, intervention end, and 1-month follow-up (high aOR 1.85, 95% CI 1.21-2.82) but abstinence rates did not differ. **Conclusions:** SmokefreeEsp users had lower dropout rates than Whites and Latinos in SmokefreeTXT and higher response rates than Latinos in SmokefreeTXT but were no more abstinent. Across both interventions, Latinos had lower response and abstinence rates than Whites. Cultural targeting improved retention and response rates, but more work is needed to improve abstinence and reduce cessation disparities in abstinence between Whites and Latinos.

FUNDING: Federal

POD8-3

INDIVIDUAL-LEVEL BEHAVIOURAL SMOKING CESSATION INTERVENTIONS TAILORED FOR DISADVANTAGED SOCIO-ECONOMIC POSITION: A SYSTEMATIC REVIEW AND META-REGRESSION

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Significance: To our knowledge, no review has examined the overall effect of individual-level interventions for smoking cessation in socio-economically disadvantaged groups, or whether socio-economic position (SEP)-tailoring moderates intervention effectiveness. **Background:** Socio-economic inequalities in smoking cessation has led to the development of interventions that are specifically tailored for smokers from disadvantaged groups (SEP-tailored interventions). **Methods:** Medline, Psychinfo, Embase, Cochrane Central Register and Tobacco Addiction register of Clinical Trials and the IC-SMOKE database were searched from their inception until July 31 2018 for randomised controlled trials (RCTs) of SEP-tailored or non SEP-tailored individual-level behavioural interventions for smoking cessation at ≥ 6 months follow-up. Studies were excluded if they did not report outcomes by SEP. Data was extracted from published reports and from study authors. Random-effects meta-analyses and mixed-effects meta-regression analyses were performed to assess associations between tailoring of the intervention and intervention effectiveness. Meta-analysis outcomes were summarised as risk ratios (RR, 95% CI). Certainty of evidence was assessed within each study using the Cochrane 'Risk of bias 2' tool and the GRADE approach. **Results:** Forty randomised controlled trials were identified. There was moderate certainty evidence that individual-level behavioural support for smoking cessation in disadvantaged groups was more effective than usual care/control, irrespective of tailoring (RR 1.59, 95% CI 1.39 - 1.83; 40 studies, 22,580 participants; $I^2 = 60.3\%$). In unadjusted and adjusted meta-regression models, SEP-tailored interventions did not yield better outcomes (RR) than non SEP-tailored interventions for disadvantaged groups (adjusted RR = 1.01(logRR (B) = 0.01, SE = 0.14), 95% CI = 0.77 - 1.32). Similar effect-sizes and levels of heterogeneity were observed in separate meta-analyses of non SEP-tailored interventions using trial data from high-SEP (RR 2.08, 95% CI 1.40 - 3.10, $I^2 = 81.9\%$) and low-SEP participants (RR 2.11, 95% CI 1.33 - 3.33, $I^2 = 76.3\%$). **Conclusions:** There was moderate certainty evidence that individual-level interventions can assist disadvantaged smokers to quit but there were no large moderating effects of tailoring for disadvantaged smokers. Improvements in tailored intervention development may be needed to achieve equity positive smoking cessation outcomes.

FUNDING: Nonprofit grant funding entity

POD8-4

A RANDOMIZED CONTROLLED TRIAL OF JUUL E-CIGARETTES FOR AFRICAN AMERICAN AND LATINX SMOKERS

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Background: The use of electronic cigarettes (ECs) as an effective risk reduction strategy for smokers is largely contingent on exclusive use. African American (AA) and Latinx (Lx) smokers are less likely to use ECs and exclusively switch, reasons for which are not well understood. Furthermore, there are no randomized clinical trials evaluating newer nicotine-salt and pod-based EC technology, such as JUUL, among smokers. **Methods:** Latinx (Lx) and African American (AA) daily cigarette smokers (N=186) interested in switching to ECs were randomized (2:1) to an EC group (N=125; 63 Lx, 62 AA) or an

assessment-only control group (N=61; 31 Lx, 30 AA). Those randomized to EC received 6 weeks of JUUL ECs (5 mg/ml) nicotine in a choice of four flavors and were encouraged to switch completely from cigarettes to ECs. Those randomized to assessment only were not provided with ECs or encouraged to switch. Measurement of tobacco use, urinary cotinine (metabolite of nicotine), 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL; pulmonary carcinogen), carbon monoxide (CO), lung function (FEV1/FVC%), respiratory symptoms, and blood pressure was conducted at baseline (BL) and Week 6 (W6). Between group change in outcomes were evaluated based on the intention to treat principle and used linear regression models controlling for baseline factors. **Results:** Those randomized to the EC group had lower NNAL, CO, and respiratory symptoms at W6 ($p < .001$) relative to controls. Cotinine, lung function, systolic and diastolic blood pressure changes did not differ (all p 's=ns) between the EC and control group at W6. 24.6% of those randomized to EC completely switched to EC use only (verified with CO <6), with pronounced reductions in NNAL, CO, and respiratory symptoms from BL to W6 relative to the control group. **Conclusion:** This study provides evidence of significant toxicant exposure reduction for Lx and AA smokers who use JUUL ECs. Reducing morbidity and mortality in underrepresented minorities who smoke may be accelerated through use of ECs. This study provides some of the first evidence of effects of nicotine-salt, pod-based ECs on smokers.

FUNDING: Federal

POD8-5

CUMULATIVE AREA-LEVEL DISADVANTAGE BUT NOT RACE PREDICT ABSTINENCE IN A SMOKING CESSATION TRIAL

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SIGNIFICANCE: Area-level socioeconomic disadvantage is associated with smoking prevalence, yet little is known about how it influences quitting within smoking cessation trials. Indicators of disadvantage are often considered individually, yet disadvantage co-occurs, is not equally distributed across race/ethnicity, and may have synergistic effects on abstinence. This study examined the impact of area-level disadvantage on abstinence of low income African American (AA) and White (W) smokers interested in quitting. **METHODS:** Participants were 223 AA and 221 W smokers stratified on age and gender enrolled in a smoking cessation trial of varenicline and smoking cessation counseling. Outcome was salivary cotinine-verified abstinence at week 26. Tract-level disadvantage included percentage non-Hispanic AA, female headed households, on public assistance, unemployed, < 100% of the federal poverty level, and with $\geq 25\%$ having less than a high school education. Tract-level variables were US census tract 5-year estimates (2008-2012; American Community Survey) linked to participants' home address using ArcGIS. A cumulative neighborhood disadvantage index score (DIS) was created for our sample by calculating the z-scores for each variable and their sum (range: -16, 16). A cumulative DIS was calculated for all US census tracts. DIS of 0 indicates the US median level of disadvantage; negative scores indicate less and positive scores indicate more disadvantage. Logistic regression examined DIS, race, and the interaction in predicting week 26 abstinence. **RESULTS:** 444 participants lived in 240 unique census tracts. The sample median DIS was -0.09 (range -6.6, 15.6), indicating slightly more disadvantage than the US (median = 0). AA were more disadvantaged than W [DIS: 5.2 (5.5), -1.1 (3.7), $p < 0.001$] and continued smokers were more disadvantaged than quitters [DIS: 2.5 (5.7), 0.01 (4.9), $p = 0.003$]. AA and W had similar rates of abstinence at the same levels of disadvantage [DIS $\geq 50^{\text{th}}$ percentile: 22.0% AA, 26.0% W; DIS < 50th percentile: 11.0% AA, 15.0% W]. Only DIS was retained in the final model predicting week 26 abstinence; each unit increase in DIS was associated with 8% reduced odds of abstinence (OR: 0.92, 95% CI: 0.87, 0.97). **CONCLUSIONS:** Area-level socioeconomic disadvantage but not race predicted abstinence. Residential context is rarely considered within smoking cessation studies but impacts quitting. Smokers living in disadvantaged areas may require extra support to achieve abstinence.

FUNDING: Federal; Pharmaceutical Industry

**POD8-6****RACE MODERATES THE EFFECTS OF MOTIVATIONAL INTERVIEWING ON SMOKING CESSATION INDUCTION**

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Significance: Health disparities necessitate exploration of how race moderates response to smoking cessation treatment. Findings are mixed as to whether Motivational Interviewing (MI) is less effective in African American (AA) smokers compared to other active therapy options. Data from a randomized clinical trial of MI for smoking cessation induction were used to explore differential treatment response between African American (AA) vs Non-Black (NB) smokers. **Methods:** Adult tobacco smokers (138 AA vs 66 NB) with low desire to quit were randomly assigned to four sessions of MI or health education (HE). Outcomes (e.g., quit attempts, motivation to quit) were assessed at baseline, 3- and 6-months. **Results:** There was evidence of a Race by Treatment interaction such that MI was less effective than HE in AA smokers. Mean Cohen's d for the interaction effect was -0.32 (95% CI [-0.44, -0.20]). However, the race interaction could be accounted for by controlling for baseline relationship status and communication preference (wants directive approach). **Conclusions:** For AA smokers, MI appeared less effective when compared to a more directive therapeutic approach (HE). While not contraindicated, MI may be a less preferred option in AA when other active treatments are available. Failing to accommodate for differential response to various treatments across race may contribute to apparent racial disparities in tobacco related outcomes. Furthermore, psychosocial variables may be able to account for differential race outcomes. **Note:** This manuscript is based on a secondary analysis of Catley, et al., *Am J Prev Med* 2016;50(5):573-583; <http://dx.doi.org/10.1016/j.amepre.2015.10.013> (ClinicalTrials.gov NCT01188018 October 2010), supported by National Cancer Institute Grants R01 CA133068. Pfizer provided varenicline (Chantix®) through Investigator-Initiated Research Support (No. WS759405).

FUNDING: Federal; Pharmaceutical Industry

PAPER SESSION 9: SWITCHING AND SUBSTITUTION: MOVING PAST COMBUSTIBLE TOBACCO**POD9-1****COMPARATIVE EFFICACY OF ELECTRONIC CIGARETTES (E-CIGARETTES) VERSUS NICOTINE PATCHES (NP) AS A SHORT-TERM REPLACEMENT FOR TOBACCO CIGARETTE SMOKING: A CROSS-OVER STUDY**

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Significance: E-cigarettes have been reported to decrease tobacco withdrawal, craving and consumption. Moreover, some research suggests smokers using an e-cigarette are as or more likely to achieve smoking abstinence compared with smokers using nicotine replacement therapy (NRT). Maintenance of smoking abstinence during the first week of a quit attempt may also predict long-term abstinence. Therefore, we aimed to compare the efficacy of non-nicotine e-cigarettes (NNE) and nicotine e-cigarettes (NE) against NP for short-term replacement of tobacco cigarette smoking in smokers not interested in quitting. **Methods:** This is a within subjects, single blind, partial Latin square design study. Both males and females (n=18 each) are randomly assigned to the order of the 3 experimental conditions. Participants are asked to completely replace their tobacco cigarette use with each condition for 5 consecutive days (Monday to Friday) with a one-week wash-out period between conditions. Self-reported full replacement of smoking is confirmed by expired CO <5ppm at each daily study visit. A repeated measures-ANOVA is used to analyze the number of days of cigarette smoking replacement and cigarette per day (CPD) reduction. **Results:** To date, nine participants (7M, 2F) have completed the study; enrollment is on-going. The proportion of complete replacement for NE, NNE, and NP use over the use period was 52.8%, 38.9%, and 36.1%, respectively. The proportion of CPD reduction for NE, NNE, and NP use over 4 days was 71.1%, 69.5%, and 80.5%, respectively. No significant difference in the rate of complete replacement ($F(2, 16) = 2.92, p = 0.14$) and CPD reduction was found between products ($F(2, 16) = 1.54, p = 0.25$). **Conclusion:** Preliminary results show a trend for NE to better replace tobacco cigarette smoking than NNE and NP. Additionally, NNE may be as efficacious as NP in smoking replacement. The results also demonstrate that all three products are similarly efficacious in reducing CPD. Future analyses will investigate gender differences in withdrawal and craving by product use.

FUNDING: State

POD9-2**COMPARING SUBSTITUTABILITY BETWEEN REDUCED-NICOTINE CIGARETTES AND USUAL-BRAND CIGARETTES IN THE EXPERIMENTAL TOBACCO MARKETPLACE**

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Significance: The Food and Drug Administration recently released an Advanced Notices of Proposed Rulemaking for reducing nicotine in combustible cigarettes. Little research has examined how substitution for these cigarettes change across different regulatory environments. The current study examined substitution of reduced-nicotine cigarettes (RNCs) for usual-brand cigarettes (UBCs) and vice versa under two regulatory scenarios. In one regulatory scenario, the price of UBCs increased while the price of RNCs and other tobacco/nicotine products stayed constant. In the second regulatory scenario, the price of RNCs increased while the price of UBCs and other tobacco/nicotine products stayed constant. **Method:** One-hundred twenty-six participants (between 5-40 cigarettes smoked/day) were assigned to use one of the following cigarettes during the study: SPECTRUM investigational cigarette differing in nicotine content (15.8, 5.2, 2.4, 1.4, 0.4mg/g). Participants made a series of purchasing decisions in the Experimental Tobacco Marketplace, similar to an online tobacco storefront. Participants were provided a real allowance and received all the products purchased from one randomly selected price-purchasing scenario. Linear mixed-effects models were used to characterize how purchasing of RNCs increased corresponding to increases in UBC price and vice versa. **Results:** The results of the mixed-effects model indicated a significant cigarette type effect, such that regardless of the price of cigarettes more UBCs were purchased compared to RNCs. However, estimated marginal trends averaged over nicotine content



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suggested purchasing of RNCs increased at a greater rate with corresponding increases in UBC price compared to purchasing of UBCs with corresponding increases in RNC price. Conclusion: These results suggest UBCs are preferred and purchased in greater quantities compared to RNCs, but that RNCs have the potential to serve as substitutes for UBCs within a more complex tobacco marketplace. The presence of affordable, UBCs in the tobacco marketplace may result in sustained UBC purchasing, and that UBCs must become sufficiently expensive to promote transitions to, but lower purchasing of, RNCs. This work was supported by NIDA/NIH grant R01DA042535 and FDA Center for Tobacco Products (CTP).

FUNDING: Federal

POD9-3

THE EFFECTS OF ELECTRONIC CIGARETTE FLAVORS ON WEIGHT GAIN AMONG CIGARETTE SMOKERS IN A SWITCHING TRIAL

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Background: Post-cessation (PC) weight gain is a barrier to smoking cessation. E-cigarettes (ECs) may aid smoking cessation efforts. Previous investigations of PC weight gain after switching to ECs showed gains of 2.4-2.9kg (12 & 24weeks-PC). No studies have evaluated weight gain by EC device, flavor, or nicotine concentration. Chemicals found in EC flavors are shown to disrupt glucose homeostasis and nicotine suppresses appetite, which in turn may affect weight. This study evaluated weight gain across two EC devices by flavor and nicotine concentration among cigarette smokers switching to an EC. **Methods:** Adult cigarette smokers (N= 233; 40.6±11.6 years; 64% female; 74% white) in a larger clinical trial evaluating the effects of low wattage (LW) vs. high wattage (HW) ECs vs. continued smoking on smoking behavior and biomarkers. EC flavor was categorized into four groups: tobacco, fruit, menthol, dessert. Participants selected nicotine concentration ranging from 3-24mg/ml. Weight gain was calculated as percent change in weight at each visit from baseline to 4, 12, 26, and 52 weeks. **Results:** The effect of EC liquid flavors and nicotine concentration on weight gain over time was not significant ($p>.05$); however, LW-EC users choosing the tobacco flavor exhibited weight gain during the study (gain at week 52 = 6.5%), while HW-EC tobacco flavor users lost weight (loss at week 52 = 3.4%). Fluctuations in weight were observed within other EC flavors by EC group. **Conclusions:** Differences in weight between LW and HW-ECs were observed, but no significant differences in weight gain by EC flavor or nicotine concentration. LW-EC tobacco flavor users exhibited the greatest risk for weight gain, while HW-EC users showed modest weight loss. Future studies examining the influence of flavor, nicotine, and device characteristics that may influence weight gain are needed. **Funding:** R01CA204891(PI: Wagener)

FUNDING: Federal

POD9-4

PREDICTORS OF COMBUSTIBLE CIGARETTE CESSATION AMONG DUAL CIGARETTE AND ENDS USERS

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Significance: Many adult ENDS users are cigarette smokers who report using ENDS to help them reduce or quit smoking, but it is not yet clear who among these dual users will successfully quit and what predicts success. Identifying predictors of cessation among dual users will help improve interventions and identify individuals who may need more assistance. This study examined motivational and behavioral predictors of smoking cessation over 12 months among adult dual users. **Methods:** Adult smokers who also used ENDS participated in a longitudinal, observational study. There were no inclusion criteria for wanting to stop smoking. Data are from 342 participants (39% female; 40% White; mean age 35) who completed baseline and 12-month surveys, 7 days of EMA tracking of all tobacco use at baseline, and biweekly surveys over 12 months. **Results:** At baseline, 72% believed that ENDS help reduce or quit smoking cigarettes. At 12 months, 17% of participants had quit smoking (past 30 days abstinent), and 63% reported a quit attempt during the 12 months. Baseline predictors of cessation included intention to quit smoking within 6 months (OR=2.57, 95%CI=1.37-4.85, $p<.01$), self-reported use of ENDS more than cigarettes (OR=4.73, 95%CI=2.46-9.11, $p<.001$), daily use of ENDS when unable to smoke cigarettes (OR=2.11, 95%CI=1.12-3.94, $p < .02$), and confidence in quitting (B=0.133, Z=2.535, $p < .01$). Baseline belief that ENDS help reduce or quit smoking significantly predicted cessation (B=0.525, z=2.593, $p=0.010$), but not quit attempts. More frequent ENDS use, in number of days, in the past 30 days

at baseline and during the first 20 weeks was significantly associated with cessation ($p=0.01$ and $p=0.008$). EMA tracking of reasons for ENDS use during real time was not significantly associated with cessation. **Conclusions:** A notable minority of dual users do successfully quit one year later, and strength in beliefs about using ENDS and actual use of ENDS were significant predictors of cessation success. Dual users who do not endorse strong beliefs about use of ENDS for help with cessation or who do not actually use more ENDS than cigarettes may be targets for intervention messaging. **Funding:** Research reported in this publication was supported by the NCI and FDA Center for Tobacco Products (CTP) grant R01CA184681.

FUNDING: Federal

POD9-5

SMOKERS' EXPERIENCES WITH VAPING TO QUIT: A CONCEPT MAPPING STUDY

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Background: Electronic cigarettes (e-cigarettes) are commonly being used by cigarette smokers as a cessation aid. This study used concept mapping, a mixed-method participatory approach, to identify positive and negative experiences reported by smokers who have tried e-cigarettes/vaping to quit. **Methods:** In 2018, current or recent adult cigarette smokers who have tried vaping to quit were recruited in Ontario, Canada to complete a short survey and three online concept mapping tasks: brainstorming, sorting, and rating. Participants (n=98) generated statements by responding to a prompt: "A specific experience I've had while vaping to quit [smoking]-either positive or negative-is ..." and generated 92 unique statements. Participants then sorted statements into piles of similar content and rated each statement on how true each statement was for them using a 7-point scale. Multidimensional scaling and hierarchical cluster analyses generated a cluster map that described and organized the range of experiences of smokers who have tried vaping to quit. Mean cluster ratings were compared overall and between reported successful quitters vs. non-successful quitters. **Results:** Seven clusters of experiences were identified: Positive Outcomes of Vaping, Positive Attributes of E-cigarettes, Positive Relationships, Social Challenges, Health Concerns of Vaping, Limitations to Vaping and Vaping Devices. Mean cluster ratings ranged from a high (i.e., most true) of 4.81 (SD = 0.64) for Positive Attributes to a low (i.e., least true) of 3.31 (SD = 0.78) for Health Concerns. While all participants rated the Positive Attributes cluster the highest, participants who self-reported successfully quitting by vaping rated statements in all three positive experience clusters as more true than those who did not quit. Non-quitters rated statements related to negative experiences and health concerns about vaping higher. **Conclusion:** Participants who liked the products, had positive relationships and good experiences continued to vape to quit smoking, whereas those who had negative experiences and health concerns were less likely to succeed in quitting. Future research should examine how these experiences affect smoking and vaping behaviors over time.

FUNDING: Other

**PAPER SESSION 10: CARCINOGENICITY AND CANCER RISK OF TOBACCO PRODUCTS****POD10-1****INVESTIGATING THE CANCER-CAUSING POTENTIAL OF ELECTRONIC CIGARETTE USE**

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Significance: Electronic cigarettes (e-cigs) use, otherwise known as 'vaping', is increasingly popular among adolescent never-smokers and adult smokers seeking a less-harmful tobacco substitute. However, chemical analyses of e-cig liquid/vapor have shown the presence of many of the same carcinogens as those found in cigarette smoke, albeit in generally lower concentrations. To date, the cancer-causing potential of vaping is unknown. Global loss of DNA methylation (hypomethylation) is an epigenetic hallmark of human cancer. Because repetitive DNA elements comprise nearly 50% of the human genome and account for more than one-third of genome-wide DNA methylation, the global loss of DNA methylation observed in cancer is primarily ascribed to hypomethylation at repetitive elements. It has been shown that analysis of the methylation status of high copy number repeat elements, such as Long Interspersed Nucleotide Element 1 (LINE-1), can serve as a surrogate marker for global genomic DNA methylation. **Methods:** To investigate the impact of vaping vs. smoking on the epigenome, we quantified DNA methylation levels in LINE-1 repeat elements in leukocytes of 'exclusive' e-cig users and smokers as compared to controls (nonsmokers non-vapers) using an enzyme-linked immunosorbent assay (ELISA). Furthermore, we measured the relative expression of DNA methyltransferase 1, 3A, and 3B, which catalyze DNA methylation primarily within CpG dinucleotides, using quantitative reverse-transcription polymerase chain reaction (RT-qPCR). The e-cig users, smokers, and control groups ($n = 45$) were matched for age, gender, and race. **Results:** We detected significant loss of DNA methylation in LINE-1 repeat elements in both e-cig users and smokers as compared to controls ($P = 0.018$ and $P = 0.028$, resp.). The methylation levels of LINE-1 repeat elements were not significantly different between e-cig users and smokers ($P > 0.554$). In confirmation, we also detected changes in relative expression of DNA methyltransferase 1, 3A, and 3B in both e-cig users and smokers. **Conclusion:** This is the first demonstration of a prime epigenetic effect in e-cig users similarly to smokers. Our findings warrant further investigation into the carcinogenic potential of vaping in chronic e-cig users.

FUNDING: Federal; State

POD10-2**SCREENING FOR DNA DAMAGE INDUCED BY COMPOUNDS RELEVANT TO ELECTRONIC NICOTINE DELIVERY SYSTEMS USING ALTERNATIVE ASSAY SYSTEMS**

Matthew J. Savidge, Pei-Hsuan (Chris) Hung, Mamata De, Sheila Healy, **Luis G. Valerio Jr.** Center for Tobacco Products, US Food and Drug Administration, Silver Spring, MD, USA.

The increasing complexity of tobacco products, including electronic nicotine delivery systems (ENDS), is due, in part, to the rapid expansion and incorporation of unique flavor compounds into the formulation of nicotine-containing e-liquids. Nonclinical toxicity testing of all new and existing flavor compounds using conventional genetic toxicity assays would be burdensome in both time and resources. The study herein evaluates the results from an alternative in vitro method that is high-throughput for hazard identification of DNA damage. The method uses a multiplexed flow cytometric assay with human lymphoblastoid (TK6) cells, multiple biomarkers associated with DNA damage response pathways, and an ensemble machine learning method to predict the genotoxic mode of action (MoA). 150 compounds relevant to deemed tobacco products, many of which are flavors and found in candy flavored e-liquids, were screened using this in vitro approach. Of the 25 compounds identified as genotoxic, 15 were classified as clastogenic, 8 as aneugenic, and 2 identified as both clastogenic and aneugenic (mixed MoA). Compounds identified as genotoxic by the in vitro screen fell into two major chemical classes: 32% were aldehydes, and 28% were alcohols. Both compounds with a mixed MoA were cinnamaldehyde derivatives. To further inform the potential hazard stemming from exposure to these compounds, the DNA damage assay was coupled with predictive computational modeling (i.e., in silico). The (quantitative) structure-activity relationship ((Q)SAR) modeling predictions were largely concordant (86%) with the negative compounds from the in vitro screen. However, the (Q)SAR analyses were

only 56% concordant with compounds predicted to have a genotoxic MoA from the in vitro assay. Further, this concordance was compared across other (Q)SAR modeling platforms to evaluate model consensus and the predictive utility of integrating multiple in silico models with in vitro outcomes. Taken together, the results show that in vitro and in silico methodologies have the potential to act as complementary tools in setting priority for compounds of interest for further toxicological evaluation.

FUNDING: Federal

POD10-3**CADMIUM EXPOSURE AND LUNG CANCER RISK IN SMOKERS FROM THE MULTIETHNIC COHORT STUDY**

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Significance: While cigarette smoking is a major risk factor for lung cancer, only 11-24% of smokers will develop the disease. Better understanding of factors contributing to the differences in lung cancer risk among smokers is needed to identify susceptible individuals and preventative strategies. Cadmium (Cd), a constituent of cigarette smoke and a widespread environmental and industrial pollutant, is an IARC Group 1 known lung carcinogen. Variations in Cd exposure may contribute to inter-individual differences in lung cancer risk among smokers. **Methods:** We prospectively investigated the relationship between urinary Cd, a validated biomarker of long-term Cd exposure, and incident lung cancer among a subset of 1,956 current smokers at time of urine collection from the Multiethnic Cohort (MEC) Study. Cd was analyzed by inductively coupled plasma mass spectrometry in urine samples collected between 1997 and 2006. Incident lung cancer cases ($n=89$) were identified in this subcohort by linkage to the Hawaii and California Cancer registries from time of urine collection through December 31, 2016 (median follow-up time of 12.4 years). Urinary Cd was modeled as (1) continuous urinary Cd levels (natural log) and (2) quartiles of urinary Cd levels. **Results:** After adjustment for age, gender, race/ethnicity, creatinine (natural log), education, smoking dose (urinary total nicotine equivalents) and duration (years of smoking), and occupational variables, higher urinary Cd was associated with increased lung cancer risk (HR: 1.69; 95% CI: 1.26, 2.26 for a one-log increase in Cd). Categorical analysis demonstrated the multivariable-adjusted HR for lung cancer increased by increasing quartile of urinary Cd; smokers in the highest quartile of urinary Cd exhibited a 3.52-fold (95% CI: 1.83, 6.78) increased risk for lung cancer relative to smokers in the lowest quartile of urinary Cd. **Conclusion:** Findings provide strong support of evidence that urinary Cd may be an independent predictor of lung cancer risk in smokers. Replication in studies with larger sample size is warranted.

FUNDING: Federal; Academic Institution

POD10-4**SHEESHA SMOKING REDUCES THE EXPRESSIONS OF CANCER RELATED GENES**

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Background: The health effects of sheesha smoking are not well addressed. The objective of this study is to check the association between sheesha tobacco smoking and gene expressions pertinent to cancer diseases using surrogate measures. **Methodology:** Saliva samples were collected from 15 volunteers prior to and after one hour and a half of smoking sheesha "Massal double apple". We investigated genes of xenobiotic metabolism and genes found in pathway of cancers related to smoke using CFX96 for collecting data and CFX software (BioRad) for analysing them. **Results:** In the short-term with p -value = 0.00025 and effect size of $d = 1.5$, sheesha smoking reduced the expression of both xenobiotic metabolism genes and other genes known to have altered expression in tobacco related cancers in a range between 1.3 times and 55 times. *STAT3*, *PTGS2*, *CYP1A1* and *GDSTP1* show fold changes that lie within the variance of fold change of housekeeping genes. *CDKN2A*, *NMI*, *BAK1*, *ERBB2*, *EGFR*, *CNTD1*, *NOS2*, *FAS*, *CCDN1*, *CYP1B1*, *GSTT1*, and *GSTM2* present fold changes that are outside the range of variability observed for the housekeeping genes. **Conclusion:** On the level of microbiology, sheesha smoking has short-term effects on the expression of genes known to be involved in tobacco-related cancers. Tobacco smoking regardless of its mode of delivery affects your body's ability to develop cancer diseases. This is of major concern given widespread misperceptions about the likely safety of sheesha tobacco smoking.

FUNDING: Unfunded; Academic Institution



POD10-5

HUMAN HEALTH RISK ASSESSMENT FOR PULEGONE, A CARCINOGENIC CHEMICAL IN MINT- AND MENTHOL- FLAVORED E-CIGARETTE LIQUIDS AND SMOKELESS TOBACCO PRODUCTS

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Background: In October 2018, FDA enacted a new rule banning six flavor chemicals from addition to food. Animal studies demonstrated that these chemicals are carcinogens. Analytical studies by CDC revealed that one of these carcinogenic flavor compounds, pulegone, is present in US-marketed mint- and menthol-flavored e-liquids and smokeless tobacco products. Since FDA's proposed rules may exempt mint/menthol-flavored e-cigarettes from sales restriction, the health risk associated with pulegone in these products is unknown and needs to be evaluated. **Methods:** For human health risk assessment Margin of Exposure (MOE), the risk parameter used by regulatory agencies, was calculated by dividing the FDA-provided no-observed-adverse-effect-level (NOAEL) of pulegone from animal studies by the average human exposure from use of mint- and menthol-flavored e-cigarette or smoke less tobacco products analyzed in the CDC studies. Results were compared to risk due to pulegone contained in combustible menthol cigarettes. The carcinogenicity risk is inversely proportional to MOE, with a threshold of 10,000; thus, MOE values below 10,000 require risk-mitigating interventions and values above 10,000 indicate low level of public health risk. **Results:** Depending on daily consumption rates, MOEs ranged between 325-6,012 for e-liquids and 549-1,646 for smoke less tobacco, all several-fold below the threshold of 10,000, indicating increased risk. Predicted pulegone exposure in e-cigarette users was 44-1,608 times higher, and in smoke less tobacco users 126-1,319 times higher than in menthol cigarette smokers. **Conclusions:** Pulegone is present in a wide range of menthol- and mint-flavored e-liquids and smoke less tobacco, often exposing users to levels much higher than considered safe by FDA in food. Pulegone should be prioritized for carcinogenic risk-mitigating interventions before any endorsement of mint- and menthol-flavored e-cigarettes for harm reduction. Inaction will further increase risk for users from continued exposures to carcinogenic pulegone. **Funding:** 1R01ES029435-01 (NIEHS)

FUNDING: Federal



PODIUM PRESENTATION 3

PAPER SESSION 11: CARDIOPULMONARY EFFECTS OF ALTERNATIVE TOBACCO PRODUCTS: INSIGHTS FROM ANIMAL MODELS

POD11-1

SHORT-TERM EXPOSURE TO WATERPIPE SMOKE TRIGGERS A HYPERACTIVE PLATELET ACTIVATION STATE AND INCREASES THE RISK OF THROMBOGENESIS

Ahmed B. Alarabi, Zubair A. KARIM, Jean Ramirez, Keziah R. Hernandez, Patricia A. Lozano, José O. Rivera, Fatima Z. Alshbool, **Fadi T. Khasawneh**. The University of Texas at El-Paso, El Paso, TX, USA.

Cardiovascular disease (CVD) is a major public health problem. Among CVD's risk factors, tobacco smoking is considered the single most preventable cause of death, with thrombosis being the main mechanism of CVD mortality in smokers. While tobacco smoking has been on the decline, the use of waterpipes/hookah has been rising, mainly due to the perception that they are "safer"/"less harmful" than regular cigarettes and their appealing nature. Strikingly, there are few studies on the negative effects of waterpipes on the cardiovascular system, and none regarding their direct contribution to thrombus formation. To address these issues, we employed a waterpipe whole body exposure protocol that mimics real-life human exposure scenarios, and investigated its effects, relative to clean air exposure, on platelet function, hemostasis and thrombogenesis. We found that, waterpipe smoke (WPS) exposed mice exhibited both shortened thrombus occlusion and bleeding times. Further, our results show that platelets from WPS exposed mice are hyperactive, with enhanced agonist-induced aggregation, dense and a granule secretion, $\alpha\text{IIb}\beta_3$ integrin activation, phosphatidylserine expression, when compared with clean air exposed platelets. Finally, at the molecular level, it was found that Akt and ERK phosphorylation are enhanced in the WPS platelets. Our findings demonstrate, for the first time, that WPS exposure directly modulates hemostasis and increases the risk of thrombosis, and that this is mediated, in part, via a state of platelet hyperactivity. The negative health impact of WPS/hookah, therefore, should not be underestimated. Moreover, this study should also help in raising public awareness of the negative health effects of waterpipe/hookah.

FUNDING: Unfunded; Academic Institution

POD11-2

IN VITRO AND IN VIVO PULMONARY TOXICITY OF INHALED OPEN AND CLOSED ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) AEROSOLS - THIRD-GENERATION ELECTRONIC-CIGARETTES AND JUUL

Alexandra Noel¹, Ehktear Hossain¹, Rakeysha Pinkston², Zakia Perveen¹, Brittany Szafran³, Barbara Kaplan³, Arthur Penn¹. ¹Louisiana State University, Baton Rouge, LA, USA, ²Southern University, Baton Rouge, LA, USA, ³Mississippi State University, Starkville, MS, USA.

Significance: Electronic nicotine delivery systems (ENDS), introduced to the US in 2007, are presently used by 8 million adults. Although JUUL has been marketed only since 2015, it is now accounting for ~70% of US ENDS sales. Since ENDS have been studied for barely a decade, the range and intensity of health effects caused by inhalation of ENDS aerosols are largely unknown. Methods: We investigated the pulmonary responses induced by freebase nicotine aerosols produced by third-generation tank-style electronic cigarette (e-cig) devices and nicotine salt aerosols generated by JUUL devices in both an air-liquid interface (ALI) *in vitro* system and an *in vivo* model. Results: Using standard vaping topography, we found that high levels of acrolein (9.57 $\mu\text{g}/\text{puff}$) and formaldehyde (8.23 $\mu\text{g}/\text{puff}$) were generated from butter-flavored e-cig aerosol, while formaldehyde (0.043 $\mu\text{g}/\text{puff}$) and benzoic acid (69.5 $\mu\text{g}/\text{puff}$) were produced by crème brûlée-flavored JUUL aerosol. *In vitro*, at the ALI, we showed that human lung epithelial cells exposed to e-cig or JUUL aerosols for up to 6 days exhibited significantly decreased cell viability, increased oxidative stress levels and dysregulated inflammatory gene expression. *In vivo*, 6-week inhalation exposures to e-cig aerosols composed of

propylene glycol and vegetable glycerin alone, or with vanilla flavoring, affected mouse lung immunity, evidenced by increased percentages of dendritic cells, CD4 and CD19 populations, indicating an early inflammatory reaction. Also, the vanilla-flavored e-cig aerosol impaired mouse lung mechanics by increasing lung volumes and tissue damping, both associated with obstructive lung diseases. Further, nicotine salt e-cig aerosols' lung gene expression results suggested immunosuppression and mucus hypersecretion, hallmarks of obstructive lung diseases. Conclusion: Overall, our data suggest that both open (third-generation e-cig) and closed (JUUL) ENDS aerosol exposures can induce functional, immune, and molecular changes in the lungs. This study provides scientific evidence that ENDS use may not be 'safe' for human health.

FUNDING: Federal; Academic Institution

POD11-3

THE EFFECTS OF IN VIVO EXPOSURE TO EMISSIONS FROM E-CIGARETTE AEROSOLS CONTAINING NICOTINE SALTS ON PULMONARY INFLAMMATION AND DAMAGE

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Significance: Although combustible tobacco cigarettes remain the most popular nicotine-containing product in the United States, non-cigarette products are evolving rapidly. The increase in EC use, particularly among youth, coincides with the rise in sales of the new generation of nicotine vaporizers called *pods*. Pods have soared in popularity, most notably, one brand, *Juul*. Each pod holds highly concentrated solution of **nicotine salt**. We studied the impact of inhalation exposure to emissions from e-cigarette containing nicotine benzoate on the outcome of pulmonary inflammation and lung epithelial cell damage. Methods: In order to evaluate if short term *in vivo* exposure to nicotine salt aerosols has the potential to recruit immune cells into the lung, we exposed mice (both male and female) to emissions from e-cigarette containing either unflavored nicotine benzoate solution or nicotine-free unflavored solvent (PG:VG only). We also exposed mice to air (controls). After 6-week exposure, all mice received an oropharyngeal instillation of live bacteria. At 3 points after instillation we sacrificed mice and measured bacterial load in the lung. Cytokine levels were measured in bronchoalveolar lavage (BAL) fluid from individual mice and albumin levels in the BAL served as a surrogate of epithelial cell damage. Results: Our results clearly reveal that bacterial clearance from the lung was diminished in animals at 6 hrs (reduced but not significant) and 18 hrs (statistically significant) after infection if mice had inhaled aerosols of nicotine benzoate compared to exposure to air or PG:VG aerosols. Changes in inflammatory responses were reflected by the augmented levels of multiple proinflammatory cytokines in the BAL fluid of mice that had inhaled aerosols of nicotine benzoate. We noted statistically significant increases in albumin levels in the BAL of mice exposed to nicotine benzoate aerosols when compared to air or PG:VG exposure, a measure of increased lung epithelia damage. Conclusions: Our studies reveal, for the first time, important insights into the contribution of emissions from nicotine salt containing products to increased inflammatory pathology and injury.

FUNDING: Federal; Academic Institution

POD11-4

JUUL MODULATES PLATELET FUNCTION AND THROMBOGENESIS IN MICE

Jean Ramirez, Zubair A. Karim, Ahmed B. Alarabi, Keziah R. Hernandez, Jose O. Rivera, Fadi T. Khasawneh, **Fatima Z. Alshbool**. The University of Texas at El Paso, El Paso, TX, USA.

Background: Cigarette smoking is the single leading preventable cause of death in United States, and is associated with serious health problems including thrombosis-based cardiovascular disease. While smoking has been on the decline, e-cigarette usage has been on the rise; especially among youth, with 78% increase in usage in 2018 compared to 2017 among high school students. One particular e-cigarette device that has experienced significant popularity over the past 2 year is JUUL, which accounts for 40% of the e-cigarette retail market share. Thus, it is paramount to establish the cardiovascular safety of JUUL. Methods: We employed a passive e-Vape™ vapor inhalation system and investigated the effects of JUUL, relative to clean air, on platelet activation and thrombogenesis. This was achieved by conducting a host of platelet function assays

**PAPER SESSION 12: GENETIC INFLUENCES ON NICOTINE DEPENDENCE****POD12-1****GENE-ENVIRONMENT INTERACTION ANALYSIS REVEALS DIFFERENT GENETIC EFFECTS OF VARIANTS IN NICOTINE AND GLUTAMATE/GABA RECEPTOR ON DEPRESSION IN SMOKERS VERSUS NON-SMOKERS**

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Background: Depression is closely associated with tobacco smoking. However, not all smokers exhibit more depressive symptoms than non-smokers. Identification of genetic markers that can alter the association between smoking and depression is of great importance for the prevention and treatment of psychiatric comorbidities. **Methods:** In this study, 538 variants across 45 genes in the nicotine-GABA-glutamate system were analyzed for 2,356 smokers and 2,461 non-smokers. Linear regression was used to evaluate the effect of genotype, smoking, and their interaction on depression. Gene × gene (G×G) interaction effects on depression were assessed in smokers and non-smokers separately using GMDR. Besides, the mood-related smoking motives were evaluated in different genotypic groups. **Results:** The G×E interaction analysis identified four SNPs exerting opposite effects on depression between smokers and non-smokers ($p=0.0012\sim 9.82\times 10^{-6}$). In addition, significant G×G interactions among the four susceptibility variants were detected in smokers ($p=0.00197\sim 1\times 10^{-6}$), but not in non-smokers. For the top SNP rs61737502 in *CHRNA4*, the association between smoking and depression was abolished in the minor allele (G) carriers. Moreover, the pleasure-enhancing effect of smoking was significantly correlated with smoking rate in the AA genotypic group ($p=7.64\times 10^{-9}$) but not in the G allele carriers ($p=0.90$). **Conclusions:** Individuals' depression level in relation to smoking can be modulated by their genetic makeup of the newly identified variants. Our results also highlight the different genetic architecture underlying depression in smokers and non-smokers.

FUNDING: Federal; Academic Institution

POD12-2**OVERLAPPING GWAS RESULTS FROM SOCIALLY ACQUIRED NICOTINE SELF-ADMINISTRATION IN OUTBRED RATS AND HUMAN SMOKING**

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Recent human GWAS have identified hundreds of genes associated with smoking phenotypes. This great achievement created an urgent need to prioritize the targets for validation and further mechanistic studies. We established a rat model of socially acquired nicotine intravenous self-administration (IVSA), where social learning of a nicotine-associated odor cue reversed conditioned flavor aversion and promoted nicotine intake. We are conducting a GWAS using this model in a population of adolescent heterogeneous stock rats. Each rat was also phenotyped on several additional behavioral traits (e.g., open field, novel object interaction, social interaction, elevated plus maze) prior to nicotine IVSA. Each rat was genotyped using the genotype-by-sequencing method. Our preliminary GWAS results from approximately 1,000 rats have found many quantitative trait loci (QTL) that exceeded genome-wide significance ($p < 2.5 \times 10^{-6}$) for many behavior and nicotine phenotypes, such as nicotine intake, number of operant responses, and reinstatement of nicotine seeking. At least 11 genes under the genome-wide significant QTL peaks for nicotine IVSA have been implicated in human GWAS for smoking-related phenotypes (e.g. *Cped1*, *Col4a1*, *Cacna2d3*). Additional overlaps with GWAS for psychiatric diseases were also found (e.g., *Dlg2*). We also measured nicotine metabolism in 92 rats and found that the level of plasma cotinine was not correlated with nicotine intake ($r = 0.01$, $p=0.96$). In summary, our data showed that rat GWAS on socially acquired nicotine IVSA represent a unique replication of human GWAS on smoking, and suggested that genes overlapping human and rat GWAS are some of the best candidates for mechanistic studies. Funding: P50DA037844

FUNDING: Federal

and an *in vivo* thrombosis model. As for the exposure, we employed C57/BL6 mice (10-12 weeks old males) and subjected them to a total of 70 puffs per day for 2 weeks; puff duration was 3 secs, puff interval 25 secs, and puff volume 50 ml. As for the e-liquid, we used JUUL pods that contained 5% nicotine by weight and a menthol flavor. Results: Our results show that platelets from JUUL-exposed mice are hyperactive, with enhanced aggregation, dense and alpha granule secretion, activation of the $\alpha\text{IIb}\beta 3$ integrin, and phosphatidylserine expression, as well as Akt and ERK activation, when compared to clean air exposed platelets. Furthermore, the e-cigarette-exposed mice also exhibited a shortened thrombosis occlusion and bleeding times. Conclusion: We demonstrated for the first time- that exposure to JUUL, even when short-term- increases the risk of thrombosis and alters physiological hemostasis, in mice. This is due, at least in part, to the hyperactive state of platelets. These findings indicate that JUUL is not safe, or as safe as it is presently thought to be. These results should also increase public awareness of the negative health consequences of the increasingly popular JUUL device, and of e-cigarette in general.

FUNDING: Unfunded; Academic Institution



POD12-3

CONVERGENT FINDINGS FROM GENETIC AND FUNCTIONAL STUDIES IMPLICATE A CRITICAL ROLE OF RS148582811 IN ARVCF FOR NICOTINE DEPENDENCE

Zhongli Yang, Jiali Chen, Yunlong Ma, Ming D. Li. Zhejiang University, Hangzhou, China.

Nicotine dependence (ND) is a chronic disease with substantial heritability. Various genes and variants have been implicated for ND in both European-American and African-American populations, but their involvement with smoking in Chinese population is largely unknown. Furthermore, molecular mechanisms underlying those identified susceptibility genes and variants for ND are rarely investigated. In this study, we conducted a whole-genome sequencing study in 1,329 Chinese unrelated subjects with 805 heavy smokers and 524 age-matched non-smokers, which identified multiple loci associated significantly with smoking status and CPD at a genome-wide significance level ($P < 5 \times 10^{-8}$). Of these identified variants, seven were replicated in an independent sample with 3,744 subjects, among which SNP rs148582811 of Armadillo Repeat gene deleted in Velo-Cardio-Facial syndrome (*ARVCF*) gene was also overlapped with the peaks of enhancer associated markers in SK-N-SH cells based on the chromatin immunoprecipitation sequencing (ChIP-seq) data from the ENCODE Consortium. Furthermore, luciferase reporter assay demonstrated that the DNA region containing rs148582811 acted as an enhancer and the activity of which was significantly affected by rs148582811 genotype. Considering that rs148582811 is located in a potential enhancer region, we generated rs148582811-knockin (KI) and knockout (KO) HEK239T cell lines by using CRISPR/Cas9 genome editing technique and found that rs148582811 significantly regulated *ARVCF* expression in these edited cells. We also evaluated the mechanism underlying the rs148582811 and found that a transcription factor *XRCC5* binds to rs148582811 based on DNA pull-down and electromobility shift assays. Finally, we demonstrated that *XRCC5*-knockdown (KD) decreased the expression of *ARVCF* in SH-SY5Y cells. In sum, these findings from genetic and functional studies strongly suggest the involvement of rs148582811 of *ARVCF* in the etiology of ND and likely other addictions.

FUNDING: Federal; Academic Institution

POD12-4

ASSOCIATION BETWEEN GENETIC PREDISPOSITION TO INITIATE SMOKING AND EVER USE OF ELECTRONIC CIGARETTES

Jasmine N. Khouja, Amy E. Taylor, Marcus R. Munafò. University of Bristol, Bristol, United Kingdom.

Significance. Observational studies have shown a strong association between smoking and vaping, but it is unclear whether this link is causal or the result of shared aetiology (e.g. risk-taking behaviour). The aim of this study was to investigate whether there is a shared genetic aetiology underlying smoking initiation and ever use of e-cigarettes. Methods. We calculated polygenic risk scores for smoking initiation in a UK-based young adult cohort, the Avon Longitudinal Study of Parents and Children (ALSPAC), using single nucleotide polymorphisms (SNPs) identified in a recent genome-wide association study (the Genome Wide Association Studies & Sequencing Consortium of Alcohol and Nicotine use). We investigated the association between these scores and both smoking initiation and ever e-cigarette use among 24-year olds in ALSPAC using logistic regression. A range of p-value thresholds (5×10^{-8} to 0.5) were used to determine which SNPs were included in the polygenic risk scores. We also investigated the association of the smoking initiation polygenic risk scores with negative control outcomes (a range of other risky behaviours). Results. We found a strong association between polygenic risk scores and both smoking initiation (OR 1.09, 95% CI 1.01 to 1.18 at p-value threshold = 5×10^{-8}) and ever e-cigarette use (OR 1.14, 95% CI 1.05 to 1.23 at p-value threshold = 5×10^{-8}). We found some evidence of association between these scores and negative control outcomes when scores were created using less stringent thresholds. Similar patterns of associations were found when restricting the analyses to those who have never smoked before. Conclusions. The strong association found between genetic risk for smoking initiation and ever e-cigarette use is consistent with a causal effect of smoking initiation on ever e-cigarette use. However, the negative control analyses suggest that this may reflect the effect of a more general genetic risk for risky behaviours. Restricting the analyses to never smokers indicated that the association is not solely due to a causal link between smoking and vaping.

FUNDING: Other

POD12-5

PLACEHOLDER TITLE

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Significance. Identifying, validating and translating biomarkers for smoking cessation encompasses a range of approaches and challenges. One biomarker, the biochemical measure of nicotine metabolism (nicotine metabolite ratio, NMR), has progressed to prospective clinical validation, with metabolism-informed care yielding improvements in medication matching. We previously demonstrated GWAS-informed, pathway-based penalized regression and Bayesian algorithms accounting for the majority of NMR variance in a set of laboratory-based studies. Methods. We have developed a protocol encompassing multiple datasets of different designs to extend these analyses. We have developed NMR and total nicotine equivalent (TNE) prediction algorithms using datasets of two designs and associated data types: laboratory studies of nicotine metabolism using labeled compounds (N=314), and a longitudinal cohort with cross-sectional sampling of smokers and urine nicotine metabolite analysis (N=2,239). We validated NMR models developed in the laboratory studies, and developed novel TNE models in the longitudinal study. Results. The validated NMR models in the larger longitudinal study explained explained on average 6% more variance and exhibited differences in the number and weighting of SNPs. We have genotyped an additional sample of 585 longitudinal cohort participants, and have developed a novel genome-wide modeling method to further refine our NMR and TNE models in a larger sample. We have gained access to a large (N=3,499) sample of ever smokers from research and treatment cohorts with multiple measures of nicotine dependence and genome-wide data; we will apply our NMR and TNE models to these samples to provide estimates of the nicotine biomarker genomic contribution to nicotine dependence. Conclusion. Translation to clinical research applications will occur in multiple randomized trials of cessation therapies with a) estimation of nicotine biomarkers and delivery of genotypes and biomarker estimates to clinical collaborators, and b) analysis of the nicotine biomarker genomic contribution to measures of prospective abstinence.

FUNDING: Federal

**PAPER SESSION 13: RAPID FIRE CESSATION CONSIDERATIONS FOR MEDICAL POPULATIONS****POD13-1****DO TUBERCULOSIS PATIENTS WHO QUIT SMOKING HAVE BETTER CLINICAL OUTCOMES THAN THOSE WHO DON'T? EVIDENCE FROM A LARGE TWO COUNTRY RANDOMIZED CONTROLLED TRIAL**

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Significance: Smoking increases the risk of developing tuberculosis (TB). Despite treatment, TB patients who smoke have poorer outcomes compared to non-smokers this manifesting as slower recovery, more relapses after treatment completion and increased risk of death. It is not known if quitting during the six-month TB treatment course, improves TB outcomes.

Methods: We conducted a post-hoc analysis within a large smoking cessation trial conducted in drug-sensitive TB patients who were smoking regularly at the time of diagnosis. Conducted in 28 health centers in Bangladesh and Pakistan, this was a two arm, double-blind, randomized, placebo-controlled trial comparing the effectiveness of Cytisine added to behavioral support with behavioral support alone in achieving continuous abstinence at six months. An eight-point clinical TB score was measured at baseline and during follow-up (a lower score indicates better health). We compared mean TB scores between those who stopped smoking at month-6 (verified biochemically) with those who did not, using linear regression.

Results: We recruited 2,472 TB patients into the trial and were able to follow up 92% (2,273) at month 6. Combining data from both trial arms, 34% (771/2,273) of participants stopped smoking (self-report verified biochemically) at month 6. Average TB score at that time was lower (more improved) among those who stopped smoking (M 1.18, SD 1.44) than among those who did not (M 1.32, SD 1.46), i.e. a mean difference of 0.14 (95% 0.01 to 0.26) in TB scores between the two groups, which even after accounting for baseline differences in TB score between quitters and non-quitters remained statistically significant (p=0.011).

Conclusion: This secondary analysis suggests that TB patients who stopped smoking completely during their six-month course of TB treatment fared clinically better than those who did not. In addition to offering standard TB treatment, health professionals should help their patients quit smoking. Adding smoking cessation to TB care has the potential to improve TB outcomes.

Funding: European Union Horizon 2020

FUNDING: Nonprofit grant funding entity

POD13-2**A MULTICENTER RANDOMIZED CONTROLLED TRIAL OF INTENSIVE GROUP THERAPY FOR TOBACCO CESSATION AMONG HIV-INFECTED CIGARETTE SMOKERS**

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Of the more than 1.1 million persons living with HIV (PLWH) in the US, 42-59% smoke cigarettes, and 75% are interested in quitting. Tobacco use has emerged as a leading cause of death among PLWH. Despite the need for effective cessation support for this particularly vulnerable population, tobacco treatment strategies have yielded limited success to-date. Positively Smoke Free (PSF), a theory-driven, six week, eight session intensive group intervention led by professional-peer pairs and designed specifically for PLWH smokers, was tested in a multi-site randomized clinical trial among 450 urban adult cigarette smokers who are HIV+. Between 2014 and 2017, 216 participants were randomized to the PSF group therapy condition (plus NRT) and 226 participants were randomized to the control condition of brief advice plus NRT. Overall fidelity to the PSF syllabus was excellent, with 90% of prescribed topics covered, and no difference between the three sites. At three-months, 28 PSF participants (13.0%) and 15 control participants (6.6%) achieved biochemically-confirmed, seven-day point prevalence

abstinence (O.R.=2.10 [95% C.I.=1.10-4.14], P=0.04). At six-months, 28 PSF participants (13.0%) and 30 control participants (13.3%) achieved biochemically-confirmed, seven-day point prevalence abstinence (O.R.=0.97 [95% C.I.=0.56-1.69], P=1.0). Although higher abstinence among PSF participants at 3-months was not sustained at 6-months, PSF participants did report lower self-efficacy scores, which means higher self-efficacy to resist smoking, compared to controls at both 3-months (mean 2.9 (1.0) vs. mean 3.2 (.9), p<.01) and 6-months (mean 2.9 (1.0) vs. mean 3.1 (.9), p<.01). PSF participants also reported lower nicotine dependence (Modified Fagerstrom Tolerance Questionnaire) compared to controls at 3-months (mean 3.1 (2.4) vs. mean 3.9 (2.2), p<.002) and 6-months (mean 3.1 (2.3) vs. mean 3.7 (2.2), p<.02). Despite no sustained intervention impact on total abstinence at 6-months, lower nicotine dependence and higher self-efficacy to resist temptations to smoke were positive secondary outcomes of PSF that can be targeted in future interventions with HIV+ smokers.

FUNDING: Federal

POD13-3**EXAMINING THE EFFECTIVENESS OF PRIMARY CARE PHYSICIAN PROMOTION OF ELECTRONIC CIGARETTES VERSUS STANDARD CARE FOR SMOKING REDUCTION AND ABSTINENCE IN HARDWARE SMOKERS WITH SMOKING-RELATED CHRONIC DISEASE: A RANDOMISED CONTROLLED TRIAL**

Rachna Begh¹, Tim Coleman², Lucy Yardley³, Rebecca Barnes³, Felix Naughton⁴, Hazel Gilbert⁵, Anne Ferrey¹, Claire Madigan¹, Nicola Williams¹, Louisa Hamilton¹, Yolanda Warren¹, Jenna Grabey¹, Miranda Clark⁶, Anne Dickinson⁶, Paul Aveyard¹. ¹University of Oxford, Oxford, United Kingdom, ²Division of Primary Care, Nottingham, United Kingdom, ³University of Bristol, Bristol, United Kingdom, ⁴University of East Anglia, Norwich, United Kingdom, ⁵UCL, London, United Kingdom, ⁶University of Nottingham, Nottingham, United Kingdom.

Significance: Many smokers with smoking-related chronic diseases are unable to quit, often having exhausted all methods to stop. Primary care physicians in the UK are mandated to offer traditional cessation methods, however e-cigarettes- which are not currently offered -could be viable as an alternative harm reduction approach. This study examines the feasibility, acceptability, and effectiveness of physicians delivering a brief intervention on e-cigarettes compared with standard care in smokers unwilling to quit.

Methods: Parallel, two-arm randomised trial. Adult cigarette smokers with a smoking-related chronic condition and no intention of stopping smoking were recruited via primary care registers in England. Participants attended a routine consultation where physicians offered standard smoking cessation treatment. If declined, physicians randomised participants (1:1) to one of two groups: a control group that received no further support, or an intervention group where physicians offered brief e-cigarette advice, an e-cigarette starter pack and a practical support booklet. If accepted, participants received telephone support from an experienced vaper. Here we report on recruitment and follow-up, e-cigarette uptake and intervention acceptability.

Results: We identified 13188 current smokers from 35 general practices. Of the 918 responses received to the study invitation, 434 individuals were eligible at baseline. 324 participants were randomised by the physician to the intervention or control. Of the 164 smokers offered an e-cigarette, 148 (90%) accepted. Follow-up was 96% at 2 months. Most participants found their physician's advice appropriate (87%), with no difference between groups ($\chi^2=1.73, CI=-2.51-12.56, p=0.19$). Few participants found the advice to be inappropriate (3%), with no difference between groups ($\chi^2=2.16, CI=-1.26-7.73, p=0.14$). Most participants found the physician's advice helpful (79%); this was higher in the intervention (87%) than control (74%); $\chi^2=8.72, CI=4.39-21.48, p<0.05$). Few participants found the physician's advice unhelpful (4%), which did not differ between groups ($\chi^2=3.38, CI=-0.44-8.98, p=0.07$). Primary outcomes on smoking reduction and 7-day point-prevalence abstinence at 2 months will also be presented.

Conclusion: A physician-led brief intervention on e-cigarettes was feasible to deliver within primary care. Uptake of the offer of an e-cigarette and acceptability of the intervention was high among smokers who were initially unwilling to try other cessation treatments.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD13-4**A PARADIGM SHIFT- POINT OF CARE SMOKING CESSATION TREATMENT IMPROVES BOTH REACH AND EFFECTIVENESS**

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Significance: Smoking has important negative effects on cancer prevention and treatment outcome but is often unaddressed in cancer care due to time and resource constraints. This study provides data on the reach and effectiveness for a low-burden point of care treatment model for tobacco use assessment and treatment for outpatients at a large cancer center, developed through the Cancer Center Cessation Initiative (C3I) Cancer Moonshot program. **Methods:** Pre/post and Quasi-experimental comparisons assessed reach and effectiveness of the smoking cessation program, Electronic Health Record-Enabled Evidence-Based Smoking Cessation Treatment (ELEVATE), a point-of-care smoking cessation strategy implemented in June of 2018. **Results:** Six-month pre- and post-implementation data were compared. **Reach:** The percentage of cancer patients assessed for smoking increased from 48% to 93% (Ns=34,223; 27,728, z=145.16, p<0.001); the percentage of smokers receiving treatment (receiving in person brief advice, referral to counseling, or receiving medications) increased from 3.6% to 43% (Ns=2,917; 3,224, z=42.11, p<0.001). **Effectiveness among smokers receiving treatment:** Smoking cessation among those treated increased from 2.3% to 30% (Ns=133; 976, z=13.91, p<0.001). **Quasi-experimental pragmatic program effectiveness:** 2,846 smokers were identified during outpatient post-implementation visits and 15.2% of these smokers quit over the next 6-months. Specifically, 29.5% of smokers who were treated quit smoking during the next 6 months, and 7.6% of smokers who were not treated quit smoking over the next 6 months. Treated smokers had higher quitting success than untreated smokers (Ns=976; 1,910, z=14.32, p<0.001). **Conclusion:** A low-burden point of care treatment model led to pre-post increases in reach and effectiveness of smoking cessation treatment. Data suggest that evidence based smoking treatment ranging from cessation advice to medication, meaningfully increased cessation rates relative to untreated patients. The point of care treatment model leveraging EHR functionalities and learning health system strategies shows promise in reducing smoking in cancer centers and other healthcare settings. Future research should use experimental designs that increase strength of inference.

FUNDING: Federal

POD13-6

ACHIEVING HEALTHY CANCER SURVIVORSHIP THROUGH INTEGRATED TOBACCO CONTROL: THE SMOKING TREATMENT AND RECOVERY (STAR) PROGRAM

Kathryn Taylor¹, **Shelby Fallon**¹, **Deepa Subramaniam**¹, **Kimberly Davis**¹, **Chan To**¹, **Tania Lobo**¹, **Kenneth Tercyak**², **Julia Friberg**¹, **Mara Tynan**¹, **Emily Russell**¹, **Waseem Ahmed**¹, **Mary Chris Ponder**¹, **Lisa Cusaac**¹, **Jillian Thompson**¹, **Kellie Gardner**¹, **Joan Breece**¹, **Chul Kim**¹, **Louis M. Weiner**¹. ¹Georgetown University Medical Center, WA, DC, USA, ²Georgetown University, WA, DC, USA.

Significance. It is well-established that persistent tobacco use among patients with cancer results in numerous adverse outcomes. However, the assessment and treatment of tobacco use with evidence-based methods has been lacking in cancer care. As part of the NCI's Cancer Center Cessation Initiative, we have established our cancer center's first tobacco treatment program: a multidisciplinary, evidence-based, clinical program for all hematology/oncology patients. **Method:** Medical assistants assess tobacco use at each outpatient visit, which includes recently diagnosed patients to long-term survivors. For those who report smoking in the past 30 days, the protocol offers standard behavioral and pharmacological treatments, delivered by the tobacco treatment specialist and nurse practitioner, over 4 in-person and/or phone-based sessions. Abstinence will be assessed at 6 months post-enrollment, and 2 booster sessions will be offered to current smokers. **Results.** Of the smokers identified during the program's first 16 months (N=571; 6% of hematology/oncology patients), we reached 250/324 (77% of eligible patients), and enrolled 67/177 (38% of eligible patients). At the intake assessment, patients were an average of 60.6 years old (SD=11.3), 62% were female, 59% were African American, 37.0 (SD=42) months post-diagnosis, 12 (SD=9.3) cigarettes per day, and 29.4 (SD=17.9) pack years. Regarding readiness to quit, 13% were quit (and seeking relapse prevention), 31% had made changes but had not quit, 23% planned to quit within 30 days, 13% planned to quit within 6 months, and 20% had no plans to quit. Concerning program engagement, 70% of those enrolled completed a median of 2 treatment sessions, and patients were equally engaged with phone and in-person sessions. Partnerships with the Psychosocial Oncology and Cancer Survivorship Programs have helped to promote integrated and comprehensive care for patients during and after their cancer treatment. **Conclusions.** Tobacco treatment is an essential component of high-quality cancer treatment and survivorship care. The systematic efforts to reach and engage all current smokers have laid the groundwork for assessing the program's effectiveness and impact. Our initial results demonstrate not only the complexities but also the feasibility of developing a new tobacco treatment program in the oncology setting. The implications for cancer survivors are substantial, given the significant improvements in treatment outcomes and lower rates of disease recurrence that result from smoking abstinence.

FUNDING: Federal

POD13-6

ADDRESSING TOBACCO USE IN PRIMARY CARE - CLINICIANS' PERCEPTIONS OF REFERRAL TO A STATE QUITLINE

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Background: U.S. Public Health Service Guideline-based tobacco treatment is not routinely provided in primary care, and clinician practices regarding tobacco use intervention vary among roomers, nurses, and treating clinicians. Moreover, such treatment is influenced by factors such as the design and efficiency of cessation tools and organizational support for using them. To increase tobacco treatment delivery in primary care, we compared an EHR-based tool (eReferral) for referring patients to an evidence-based treatment (a state tobacco quitline) versus the existing standard of care, paper fax-based (Fax2Quit) referral. The eReferral approach (reported elsewhere) resulted in greater quitline use among smokers. The present analyses address staff attitudes and perceptions that contributed to their greater use of eReferral. **Methods:** 23 primary care clinics from two healthcare systems were randomized to either eReferral or Fax2Quit for quitline referral. All relevant clinic staff were emailed invitations to an anonymous online survey just before, and 6 months following program launch. Survey items addressed attitudes regarding: value of addressing tobacco use; staff self-efficacy to address tobacco use; and satisfaction with the referral process. Independent group (baseline: [Fax2Quit n=131; eReferral n=209], at 6-months: [Fax2Quit n=106; eReferral n=191]) t-tests were computed on group responses across the two periods. **Findings:** eReferral versus Fax2Quit staff reported greater increases in perceived clinic support, belief that the EHR is an effective tool for addressing tobacco use, and that steps to address tobacco use were efficient and well designed (all p<.05). No other group difference was significant. **Conclusions:** eReferral (versus Fax2Quit) clinic staff reported that the EHR system to refer patients to the quitline was better designed, more efficient, and better supported. Combined with results showing greater rates of patient referrals and engagement, these findings suggest that EHR-based eReferral is the preferred method for referring primary care patients who smoke to cessation quitlines.

FUNDING: Federal

POD13-7

INCREASING THE IMPACT OF FULL HEALTH INSURANCE COVERAGE OF SMOKING CESSATION MEDICATION: A RANDOMIZED TRIAL OF THE PARTNERS IN HELPING YOU QUIT PROGRAM

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Significance: The workplace is a key channel for delivering tobacco cessation treatment. Health insurance coverage of cessation medications (meds) removes a financial barrier to treatment, but few plans offer barrier-free access. In 2015 Partners HealthCare System (PHS), with 75,000 employees, expanded its health insurance benefit to remove copays, preauthorization, and quantity limits for all FDA-approved smoking cessation medications (even OTC). We hypothesized that adding behavioral support and care coordination to this new med benefit would increase its impact on the success of employees' quit smoking efforts. **Method:** We built Partners in Helping You Quit (PiHQ), an employee-tailored phone-based program offering biweekly calls from a tobacco treatment specialist (TTS) for 3 months (mo), then monthly monitoring for 1 year, with an option to repeat treatment. The TTS promotes behavior change and med adherence and helps providers prescribe requested meds. An RCT tested PiHQ's effectiveness vs. standard care among smokers (PHS employees or adult dependents) who responded to internal marketing about the new benefit. All enrollees received 1 call with benefit information, behavioral counseling and a med recommendation. They were then randomly assigned (2:1) to PiHQ or to active referral to the Mass. Quitline (QL) which offers 5 free calls over 3 mo. Outcomes (quit attempts, smoking cessation) were assessed at 3, 6, and 12 mo. **Results:** 106 smokers (n=73 PiHQ, n=33 QL) enrolled (64% female; 75% white, 21% black; mean age 46 y, mean cig/day=12). More PiHQ than QL smokers made a quit attempt (89 vs. 71%, p=.04) and had verified 7-day abstinence at 6 mo (31 vs. 12%, p=.03; 1^o outcome) and 12 mo (22 vs. 9%, p=.11). Employees rated counseling helpfulness higher for PiHQ vs. Quitline (p=.005). Most employees used a cessation med (PiHQ, 71%, QL, 89%, p=.25). **Conclusion:** The addition of a workplace behavioral support and care coordination program to full insurance coverage



of smoking cessation meds doubled employees' quit rates. This offers an opportunity to enhance the value to employers of providing full coverage of cessation meds through a self-insured health plan.

FUNDING: Academic Institution

PAPER SESSION 14: UNVAPING AMERICA'S YOUTH

POD14-1

HELPING TEENS AND YOUNG ADULTS QUIT VAPING VIA SMS: EARLY EXPERIENCE WITH THIS IS QUITTING

Megan A. Jacobs, MPH, Michael S. Amato, Amanda L. Graham. Truth Initiative.

In January 2019, Truth Initiative launched the first program designed to help teens and young adults (YA) quit vaping. The program is delivered entirely via text message. Users enroll by texting a number and responding to an initial age query, then receive one age-appropriate message per day tailored to their enrollment date or quit date, which can be set and reset via text message. Enrollees receive messages focused on building skills and confidence. Messages are written in first person, many of which have been submitted by other enrollees. The program has been promoted through earned and organic media. By August 2019, over 41,000 young people enrolled in the program, split nearly evenly between teens and YA. The majority set a quit date (teens=69%; YA=74%); the most common quit date was the day of enrollment (44%). Interactive keywords were used by 46% of teens and 40% of YA. Response rates to follow-up assessment questions sent by text message were 38% at 14-days and 22% at 90-days. At 14-days, 62% indicated they had reduced (teen=47%; YA=46%) or stopped (teen=14%; YA=17%) using e-cigarettes altogether. At 90-days, 7-day point prevalence abstinence (ppa) was 25% (teen=23%, YA=26%) and 30-day ppa was 15% (teen=15%, YA=15%). Most respondents (76%) responded the program should be longer. The program also presents an opportunity to conduct population surveillance among youth who are seeking treatment for addiction to e-cigarettes. A subset of users was asked to provide information about their device type and other tobacco product use. Response rates were 89% and 88% respectively. Among responders, 76% reported JUUL, 8% reported Suorin, <1% reported Vuse, and 15% reported another product or a combination of products. 67% of respondents were exclusive ecigarette users, and 12% reported dual use of combusted cigarettes. Other tobacco product use was smokeless 3%, cigars 1%, other 9%, combo of things 8%. High enrollment, engagement with the program, and encouraging e-cigarette reduction and cessation results demonstrate that young people are interested in quitting vaping and can be engaged via an easily accessible, anonymous digital platform.

FUNDING: Unfunded

POD14-2

“BEING ADDICTED TO NICOTINE SUCKS:” REASONS FOR QUITTING VAPING AMONG TREATMENT SEEKING YOUNG PEOPLE

Michael S. Amato, PhD, Sarah Cha, Mia M. Bottcher, Megan A. Jacobs, Jennifer L. Pearson, Amanda L. Graham. Truth Initiative.

Despite widespread acknowledgment of the youth vaping epidemic, there is a dearth of research on vaping cessation. Among the 41,000 young people enrolled in Truth Initiative's quit vaping program, more than 6,000 shared their reason for quitting via SMS. This study reports a qualitative analysis of users' quit reasons, compares them to a previous sample of adolescent cigarette smokers (Luther et al., 2006, Ethnicity & Disease v16), and assesses prospective associations of quit reasons with abstinence. Three authors coded N=1,000 users' reasons for quitting vaping. Disagreements were resolved through consensus. The eight categories in Luther et al. were applied as a priori codes (e.g. Health, Financial Cost). Additional in vivo codes were developed based on observed themes, e.g. Mental Health (“it makes me anxious”) and Leads to Smoking (“I don't want to start smoking”). Codes were not mutually exclusive. Prevalence of each quit reason was calculated, with differences assessed with Mann Whitney. Logistic regressions compared prospective likelihood of abstinence at 14-days and 90-days, based on reason for quitting. Initial kappas ranged from 0.72 to 1.00. Rank ordering of topic prevalence was similar to Luther et al., but the prevalence of non-health reasons was greater. The most common reasons were Health (62% vs 61% in Luther et al.), Financial Cost (22% vs 11%), Freedom from Addiction (18% vs 6%), Performance (15% vs 8%), and Social Influence (14% vs 7%). Health reasons were more prevalent among YA than teens (67% vs 59%, $p<0.01$), as were Financial Cost reasons (26% vs 19%, $p<0.01$). No significant differences in abstinence were observed in the combined models but post hoc pairwise tests suggested higher abstinence rates for users with Performance reasons than Financial reasons (19% vs 8%, $p=0.02$). Results suggest young people quitting vaping in 2019 are motivated by a greater diversity of reasons



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than young smokers in 2006. While health concerns were the most common motivator in both groups, vapers were 3x more likely to be motivated by a desire for Freedom from Addiction.

FUNDING: Unfunded

POD14-3

DEVELOPMENT AND SERVICE UTILIZATION FOR MY LIFE, MY QUIT YOUTH TOBACCO QUITLINE PROGRAM

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Significance: Tobacco, in particular e-cigarette, use and dependence among youth has increased rapidly in the past 5 years, prompting calls for effective interventions. Telephone quitlines that have been effective with adults have low reach among youth callers. Research suggests these cessation programs can be tailored for adolescents. In July 2019, we launched a dedicated teen quitline program, My Life, My Quit TM, to address an identified gap in service. **Methods:** National Jewish Health (NJH), a multi-state quitline operator, held discussions with youth and community stakeholders to identify cessation resources needed for adolescents. Youth advisors provided input on cessation messaging and reviewed educational materials. The resultant My Life, My Quit program provides print and online educational and self-help materials tailored to youth cessation needs and adapted to include e-cigarettes, streamlined registration and intake by phone or online, and promotional materials designed using messages from teens. Quitline tobacco treatment specialists received training in adolescent cognitive and psychosocial development. Youth under age 18 in nine participating states were eligible for coaching sessions conducted via phone, live text messaging, or online chat. Service use data were extracted from quitline records. **Results:** Compared to the previous year monthly average for state quitlines, total youth enrollment increased by 244% in the first month with promotion and launch of a dedicated program. Almost all (99%) enrollments started online (vs. phone), and participants enrolled in phone-only (1%), web-only (50%), or combined phone-web programs (49%). During intake, 22% of participants set a quit date. Electronic cigarettes were the most commonly used tobacco product (85%), followed by combustible cigarettes (15%) and cigars (8%). Contact with participants was primarily by online chat (47%), followed by phone (32%), and text (20%). **Conclusion:** A dedicated youth cessation program showed promising results for reaching the target audience. Engaging youth requires multi-channel communication strategies, especially online tools, such as chat, combined with phone, and text.

FUNDING: Unfunded; State

POD14-4

YOUTH TOBACCO CESSATION - THE US FOOD AND DRUG ADMINISTRATION'S RECENT EFFORTS TO DECREASE YOUTH USE

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In the last few years, there has been an alarming rise in the use of e-cigarettes by youth. According to data from the National Tobacco Youth Survey, 3.6 million middle and high school students used e-cigarettes in 2018, which is an increase of 1.5 million since 2017. In an effort to stop youth use of tobacco products, and in particular e-cigarettes, in 2018 the U.S. Food and Drug Administration (FDA) launched a multipronged Youth Tobacco Prevention Plan, involving a series of actions focused on preventing youth access to tobacco products; curbing marketing of tobacco products aimed at youth; and educating teens about the dangers of using tobacco products, and retailers about their role in protecting youth. In addition to prevention strategies, FDA is also exploring additional strategies for decreasing youth tobacco use. On January 18, 2019, FDA held an open public hearing entitled, "Eliminating Youth Electronic Cigarette and Other Tobacco Product Use: The Role of Drug Therapies" which was intended to solicit information from an array of stakeholders on the potential role of drug therapies to support youth cessation and the issues impacting product development for youth. On May 15, 2019, FDA hosted a meeting in collaboration with The Institute for Advanced

Clinical Trials (I-ACT) and the Duke Clinical Research Institute (DCRI) entitled, "Youth Tobacco Cessation: Science and Treatment Strategies". The purpose of the workshop was to discuss the basic science of tobacco addiction in adolescents; the current state of behavioral and pharmacotherapy cessation strategies in adolescents (e.g., clinical trial experience to date, use of technology/social media, impact of social factors); and the development of strategies to generate robust evidence to address youth tobacco cessation (e.g., trial design, measures of adolescent addiction, endpoint selection, co-morbidity considerations, and patient recruitment/retention). In particular, the workshop highlighted differences in treatment strategies needed in youth as opposed to adults and identified practice, research and policy interventions that could aid in addressing the e-cigarette epidemic among the nation's youth.

FUNDING: Unfunded; Federal

POD14-5

ADOLESCENT E-CIGARETTE DEPENDENCE: PREVALENCE, SYMPTOM PRESENTATION, AND ASSOCIATION WITH FUTURE VAPING

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Understanding the prevalence, symptom expression, and prognostic value of assessing adolescent e-cigarette dependence can guide clinical services and health policy. This study of adolescent e-cigarette users examined the cross-sectional prevalence and symptoms of e-cigarette dependence and whether e-cigarette dependence predicted subsequent use patterns. Participants were baseline past-year e-cigarette users (N=444, age 16-18) enrolled in a prospective cohort survey with baseline and 6-month follow-up surveys. A self-report checklist, administered separately for e-cigarettes and combustible cigarettes at baseline, reflected 10 tobacco product dependence symptoms. Reporting >1 symptoms indicated positive dependence screen. Main outcomes at 6-month follow-up were vaping continuation (any past 6-month vaping; yes/no), past 30-day nicotine vaping days (range: 0-30), episodes per vaping day (0-20), and puffs per episode (0-20). Among past-year e-cigarette users, 11.7% screened positive for e-cigarette dependence symptoms. In past-year dual e-cigarette and combustible cigarette users, cigarette dependence (29.7%) was more prevalent than e-cigarette dependence (16.4%); the most common (craving, urge, need) and least common (abstinence-related concentration and emotional problems) symptoms were similar in both combustible and e-cigarette dependence. E-cigarette dependence prevalence was higher in those who did (vs. did not) vape in the past month (17.6% vs. 5.2%, p<.001) or used e-cigarettes with (vs. without) nicotine (15.2% vs. 6.0%, p=.004). Adjusting for baseline vaping and e-cigarette dependence risk propensity scores, baseline e-cigarette dependence symptom status was associated with vaping continuation (OR[95%CI]= 2.56[1.34, 5.01]), past 30-day number of nicotine vaping days (RR[95%CI]=2.50[1.76, 3.57]), vaping episodes per day (RR[95%CI]=2.73[1.84, 4.06]), and puffs per episode (RR[95%CI]=1.73[1.14, 2.62]) at 6-month follow-up. While less severe than combustible cigarette dependence, adolescent e-cigarette dependence may be a genuine expression of tobacco product use disorder that is prognosticative of use escalation.

FUNDING: Federal; State



PAPER SESSION 15: YOUTH AND YOUNG ADULT ACQUISITION AND USE OF CIGARETTES AND ENDS. THE LATEST FINDINGS FROM THE PATH STUDY (2013-2019)

POD15-3

URINARY COTININE AND TNE-2 CUT-POINTS FOR DISTINGUISHING TOBACCO USE FROM NON-USE IN THE UNITED STATES: WAVE 1 (2013-2014) OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

Kathryn Edwards, PhD¹, Tasmia Naz¹, Cassandra A. Stanton¹, Maciej Goniewicz², Dorothy Hatsukami³, Danielle Smith², Lanqing Wang⁴, Andrea Villanti⁵, Jenni Pearson⁶, Benjamin Bount⁴, Maansi Bansal Travers², June Feng⁴, Raymond Niaura⁷, Michelle Manderski Bover⁸, Connie Sosnoff⁸, Cris Delnevo⁸, Kara Duffy⁹, Arseima Y. Del Valle-Pinero⁹, Brian Rostron⁹, Colm Everard¹⁰, Heather L. Kimmel¹⁰, Dana van Bemmel⁹, Andrew Hyland². ¹Westat, Rockville, MD, USA, ²Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA, ³UMN, Minneapolis, MN, USA, ⁴Centers for Disease Control and Prevention, Atlanta, GA, USA, ⁵UVM, Burlington, VT, USA, ⁶University of Nevada Reno, Reno, NV, USA, ⁷NYU, New York, NY, USA, ⁸Rutgers University, Newark, NJ, USA, ⁹Food and Drug Administration, Silver Spring, MD, USA, ¹⁰National Institute on Drug Abuse, Rockville, MD, USA.

The Population Assessment of Tobacco and Health (PATH) Study collects information on tobacco-use patterns, risk perceptions, and attitudes towards tobacco products including emerging tobacco products, tobacco initiation, cessation, and relapse behaviors. This nationally representative, longitudinal cohort study of approximately 46,000 adults and youth in the United States began in 2013. Having completed a special collection with youth (2017–2018) and its fifth wave of data collection (2018–2019), the Study is primed to provide an early look at recent data on tobacco product use patterns, brands used, and means of access. This symposium will 1) provide prevalence estimates of tobacco products for youth and young adults over multiple waves of data (2013 to 2019); 2) describe initiation and transitions across selected tobacco product use over time; 3) describe product characteristics such as brand, device types, and flavor use; 4) describe where youth and young adults are getting tobacco products; and 5) examine a) lifetime threshold of product use to predict future regular use; b) optimal cotinine cut points for users; and c) use of cannabis in ENDS.

FUNDING: Federal

POD15-1

YOUTH AND YOUNG ADULT ACQUISITION AND USE OF CIGARETTES AND ENDS. THE LATEST FINDINGS FROM THE PATH STUDY (2013-2019)

Andrew Hyland, PhD¹, Heather L. Kimmel², Nicolette Borek³. ¹Roswell Park Comprehensive Cancer Center, ²National Institute on Drug Abuse, Bethesda, MD, USA, ³Food and Drug Administration, North Bethesda, MD, USA.

The Population Assessment of Tobacco and Health (PATH) Study collects information on tobacco-use patterns, risk perceptions, and attitudes towards tobacco products including emerging tobacco products, tobacco initiation, cessation, and relapse behaviors. This nationally representative, longitudinal cohort study of approximately 46,000 adults and youth in the United States began in 2013. Having completed a special collection with youth (2017–2018) and its fifth wave of data collection (2018–2019), the Study is primed to provide an early look at recent data on tobacco product use patterns, brands used, and means of access. This symposium will 1) provide prevalence estimates of tobacco products for youth and young adults over multiple waves of data (2013 to 2019); 2) describe initiation and transitions across selected tobacco product use over time; 3) describe product characteristics such as brand, device types, and flavor use; 4) describe where youth and young adults are getting tobacco products; and 5) examine a) lifetime threshold of product use to predict future regular use; b) optimal cotinine cut points for users; and c) use of cannabis in ENDS.

FUNDING: Federal

POD15-2

ASSESSING LIFETIME USE THRESHOLDS OF TOBACCO PRODUCTS ON FUTURE USE, POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2017

Andrew Hyland, PhD. Roswell Park Comprehensive Cancer Center.

The Population Assessment of Tobacco and Health (PATH) Study collects information on tobacco-use patterns, risk perceptions, and attitudes towards tobacco products including emerging tobacco products, tobacco initiation, cessation, and relapse behaviors. This nationally representative, longitudinal cohort study of approximately 46,000 adults and youth in the United States began in 2013. Having completed a special collection with youth (2017–2018) and its fifth wave of data collection (2018–2019), the Study is primed to provide an early look at recent data on tobacco product use patterns, brands used, and means of access. This symposium will 1) provide prevalence estimates of tobacco products for youth and young adults over multiple waves of data (2013 to 2019); 2) describe initiation and transitions across selected tobacco product use over time; 3) describe product characteristics such as brand, device types, and flavor use; 4) describe where youth and young adults are getting tobacco products; and 5) examine a) lifetime threshold of product use to predict future regular use; b) optimal cotinine cut points for users; and c) use of cannabis in ENDS.

FUNDING: Federal

**PODIUM PRESENTATION 4****PAPER SESSION 16: ENDS: TOOLS AND
ADDITIONAL CONSIDERATIONS FOR
REGULATION****POD16-1****INTEGRATED TEST-PLATFORM FOR REAL-TIME ASSESSMENT
OF THE ENDS EMISSIONS**

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Significance: New ENDS devices are continuously appearing on the market. Coupled with the numerous available e-liquid flavors, a plethora of device and flavor combinations exist. Particularly concerning is widespread use of sub-ohm devices that heat at ~ 10 times the power (50-250 W) of previous ENDS, presenting potential greater health risk. Yet these devices, coupled with different e-liquid flavors, have not been thoroughly investigated. To best understand the potential health implications of these many combinations, a high-throughput laboratory testing system is required that could provide quick screening of the main physical and chemical properties of the ENDS. **Methods:** An Integrated Test Platform that combined simultaneous real-time aerosol size distribution measurement (differential mobility spectrometer) and toxic aldehydes detection (proton transfer reaction - quadrupole mass-spectrometer [PTR-QMS]), along with size segregated aerosol impactor sampling for batch chemical analysis was developed and applied to different types of ENDS, including powerful sub-ohm devices. Non-invasive temperature measurement of the heated coil (infrared sensor) was also conducted. The influence of heating power as well as different flavoring additives on aerosol size and toxicants production was assessed. **Results:** The high heating power of the sub-ohm devices resulted in significant aerosol size (above 1 micron) and total particle mass (above 50 mg/puff) increase as well as in elevated concentration of toxic aldehydes (formaldehyde, acetaldehyde, and acrolein). Certain flavors (such as vanillin) also led to aerosol size and aldehydes level growth. A multi-peak structure of the aerosol size distribution was observed for all ENDS tested. Aldehydes concentrations determined by PTR-QMS sampling whole ENDS emissions (i.e., both particle and gas fractions) were higher than previously reported using traditional measurement methods. **Conclusions:** An Integrated Test Platform for real-time aerosol size distribution and toxic aldehydes measurements from ENDS emissions demonstrated high throughput efficiency for assessing different types of ENDS with various e-liquid flavors. The large aerosol size generated by sub-ohm devices and enhanced by the presence of flavors will shift aerosol deposition towards the upper respiratory tract. Increased aldehydes concentrations in sub-ohm ENDS emissions with the addition of flavors presents health concerns to inform potential e-cig regulations.

FUNDING: Federal; Nonprofit grant funding entity

POD16-2**NICOTINE FLUX, A POTENTIALLY POWERFUL TOOL FOR
ELECTRONIC CIGARETTE REGULATION**

Alan Shihadeh¹, Thomas Eissenberg². ¹American University of Beirut, Beirut, Lebanon, ²VA Commonwealth University, Richmond, VA, USA.

Electronic cigarettes (ECIGs) comprise an extremely heterogeneous product class. Depending on variables like electrical power, geometry, liquid composition, and puff behavior, ECIGs can emit in 15 puffs far more or far less nicotine than a conventional tobacco cigarette. Furthermore, unlike the conventional cigarette that is consumed in a discrete unit (i.e., a single stick), ECIGs can be, and sometimes are, used continuously. These characteristics make regulating ECIG nicotine delivery challenging. We previously described "nicotine flux", the mass of nicotine emitted by an ECIG per puff second, as a critical variable governing ECIG use and abuse. For example, in a context of encouraging users of combustible products to switch to ECIGs, if flux is too low, users may abandon ECIG use and maintain their combustible cigarette smoking because they are not receiving from an ECIG the amount of nicotine that they need at the rate that they need it. On the other hand, if flux is too high, combustible cigarette smokers risk increasing their nicotine dependence and nicotine-naïve individuals who initiate ECIG use risk becoming nicotine dependent. Predicting nicotine flux is now feasible using validated computational models. Moreover, constraining flux is also feasible using intentional

product design. However, normative nicotine flux standards (i.e., minimum and maximum flux) have not been set by regulatory bodies. We review currently available ECIG technologies that can be deployed readily to constrain nicotine flux and demonstrate that from the knowledge of a few product characteristics the potential nicotine flux range of a proposed or real device/liquid combination can be predicted reliably. We propose a number of normative nicotine flux standards for several regulatory aims, including the use of ECIGs as smoking cessation tools, preventing ECIGs from increasing nicotine dependence, and limiting ECIG uptake by populations that are naïve to nicotine. Nicotine flux is an unused regulatory lever: computational models and intentional design are the fulcrum that supports this potentially powerful tool.

FUNDING: Federal

POD16-3**LIMITING ELECTRONIC CIGARETTE LIQUID NICOTINE
CONCENTRATION MAY HAVE ADVERSE HEALTH EFFECTS**

Rola Salman¹, Rachel El Hage¹, Sally Salam¹, Soha Talih¹, Nareg Karaoghlanian¹, Ahmad El Hellani¹, Thomas Eissenberg², Najat Saliba¹, Alan Shihadeh¹. ¹American University of Beirut, Beirut, Lebanon, ²VA Commonwealth University, Richmond, VA, USA.

As of May 2016, the EU limits electronic cigarette (ECIG) liquid nicotine concentration to ≤ 20 mg/ml to allow "for a delivery of nicotine that is comparable to the permitted dose of nicotine derived from a standard cigarette...". Because nicotine yield is proportional to the product of liquid concentration and device power, limiting ECIG liquid nicotine concentration can drive ECIG users to adopt higher power devices. Higher power ECIGs aerosolize more liquid per puff and may lead to greater exposure to non-nicotine toxicants while allowing users to obtain high levels of nicotine. In this study, we test the hypothesis that for advanced generation ECIGs, nicotine yield is directly related to ECIG power, liquid composition, and puff duration, and examine how these use conditions affect non-nicotine toxicants. Using the SUBOX mini C, a variable wattage device, we varied power (15, 30, and 45W), puff duration (1, 2, and 4sec), and PG/VG ratio (50/50, 30/70, and 0/100) in a randomized 3x3x3 experimental matrix and measured the amount of liquid vaporized, and yields of nicotine, carbonyl compounds (CC), phenols and reactive oxygen species (ROS). Additionally, we measured emissions while systematically varying flow rate (1, 5, and 12L/min) and nicotine concentration (12, 18, and 36mg/mL). All conditions were repeated in triplicate. Multiple and simple linear regression models were used to analyze the results. We found that all non-nicotine toxicant yields increased significantly with power and puff duration. Flow rate increase was associated with significant increases in CC yield. PG/VG ratio was not associated with any outcome measure. Nicotine yield was proportional to nicotine liquid concentration. Importantly, these results indicate that when ECIG wattage is free to vary, users may compensate for restrictions on nicotine concentration by increasing device power (and/or puff duration), and in doing so can be exposed to higher levels of non-nicotine toxicants. This outcome shows that regulating one factor at a time may have unintended consequences for public health and highlights the need for regulators to consider multiple factors simultaneously.

FUNDING: Federal

POD16-4**HEAT FLUX, A SIMPLE POWERFUL PREDICTOR OF HIGH
CARBONYL EMISSIONS FROM ELECTRONIC CIGARETTES**

Soha Talih, Rola Salman, Ebrahim Talih, Nareg Karaoghlanian, Alan Shihadeh. American University of Beirut, Beirut, Lebanon.

Electronic cigarettes (ECIGs) are a class of tobacco products that uses an electrical heating coil to vaporize a liquid. A persistent concern about ECIG devices is that their emissions often include high levels of carbonyl compounds (CCs), a powerful class of respiratory toxicants thought to induce the majority of non-cancer pulmonary disease in cigarette smokers. Puff-for-puff, ECIG CC emissions sometimes exceed those of combustible cigarettes. Observations of high ECIG CC emissions are commonly attributed to "dry puffing," which occurs when the ECIG liquid runs out. However, we routinely observe high CCs, even when the system is well-wetted. In this study, we propose an alternative construct to understand and predict the onset of high CC emissions; namely, a thermo-physical phenomenon known as film boiling. Film boiling occurs when the heat flux (q'' , W/m²) from a submerged heated surface exceeds a threshold known as the



critical heat flux (CHF). Above the CHF, a vapor layer forms on the surface and prevents heat from escaping into the surrounding liquid, causing the surface temperature to rise drastically. We hypothesize that one cause of high CC emissions is exceedance of CHF under common ECIG operating conditions. We tested several ECIG devices and wires submerged in ECIG liquids to measure CHF, examine whether real devices sometimes exceed CHF when operated as instructed by the manufacturer, and to examine whether CC emissions are correlated with crossing the CHF threshold. We found that film boiling can occur at the electrical powers recommended by the ECIG device manufacturers and that for 440 test conditions generated with 25 ECIG models, the exceedance of CHF strongly predicted observation of high CC emissions. CHF is a practical metric for ECIG product regulation aimed to minimize harm. In this presentation, we will show detailed measurements of temperature, carbonyl emissions, IR images, and gravimetric analysis that lead to this conclusion.

FUNDING: Federal

PAPER SESSION 17: ESTIMATING THE HEALTH IMPACTS OF TOBACCO USE

POD17-1

UPDATING THE GLOBAL BURDEN OF DISEASE ATTRIBUTABLE TO SMOKING USING DIRECT ESTIMATION METHODS - A SYSTEMATIC ANALYSIS OF 195 COUNTRIES AND 38 HEALTH OUTCOMES

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Significance: Previous studies estimating global smoking attributable burden have relied on a combination of indirect estimation using lung cancer mortality and direct estimation using lagged daily smoking prevalence. Limitations include not reflecting dose-response relationships, not capturing health effects among occasional and former smokers, and relying on lung cancer mortality in locations with limited or no data on this indicator.

Objective: To estimate the burden of disease attributable to smoking using direct estimation methods for 195 countries, from 1990 to 2017.

Methods: We extracted data from 3,270 nationally representative surveys and used spatiotemporal Gaussian process regression to estimate current smoking prevalence, former smoking prevalence, cigarette-equivalents smoked per day, age of initiation, and age of cessation. We adjusted for underreporting using supply-side tobacco consumption data and reconstructed pack-year smoking histories using a birth-cohort simulation. We completed systematic reviews for 38 health outcomes and estimated dose-response risk curves based on pack-years and cigarettes smoked per day among current smokers, and risk-reduction curves based on years since quitting among former smokers.

Results: Globally, 7.1 million (6.8-7.4 million) deaths were attributable to smoking in 2017, a 25% increase compared to 1990. Between 1990 and 2017, the largest reductions in smoking attributable burden were observed in Australia, the United Kingdom, and the United States, while the largest increases were observed in Uzbekistan, Nepal, and Indonesia. The geographic distribution of smoking attributable burden in 2017 varied by gender, with the highest percentage of deaths attributable to smoking among men observed in East Asia (32% [31-33%]) followed by Eastern Europe (29% [28-30%]), and the highest percentage of deaths attributable to smoking among women observed in North America (13% [12-14%]) followed by Central Europe (11% [11-12%]).

Conclusion: Updated methods for direct estimation of smoking attributable burden provide a clearer picture of the global tobacco epidemic. Smoking remains a leading global risk factor, as significant progress in tobacco control in some countries was offset by a growing epidemic in other countries.

FUNDING: Nonprofit grant funding entity

POD17-2

MODELING MORTALITY RISK EFFECTS OF CIGARETTES AND SMOKELESS TOBACCO IN CURRENT AND FORMER USERS, RESULTS FROM THE NHIS 2015 LINKED MORTALITY FILE DATA

Esther Salazar, **Chunfeng Ren**, Brian Rostron. FDA Center for Tobacco Products, Calverton, MD, USA.

SIGNIFICANCE: Cigarettes and smokeless tobacco (SLT) products are addictive and pose a significant health risk in current and former users. In the US, smoking rates have decreased while SLT use rates have increased primarily among male adults.

OBJECTIVE: To estimate mortality rates and hazard ratios (HRs) among US adults by sex, age, and tobacco-use status using NHIS linked mortality files (NHIS-LMF) with mortality follow-up through 2015. **METHODS:** NHIS-LMF data for years 1987, 1991, 1992, 1994, 1998, 2000, 2005, 2010, 2012-2014 were used to summarize age-, sex- and tobacco-use specific mortality data. A Cox proportional hazards model was used to estimate mortality HRs by tobacco-use status, age groups and sex, with a maximum 10-year mortality follow-up to prevent misclassification of tobacco-use status during the survival time. Models were fitted independently by sex and age groups and adjusted by tobacco-use status, race/ethnicity, education, body mass index, and poverty level.

RESULTS: Compared to never users, mortality HRs for male exclusive current smokers for age groups 25-44, 45-64, and 65+ are 1.64 (95% CI: 1.25-1.64), 2.24 (95% CI: 1.91-2.62), and 2.21 (95% CI: 1.97-2.49), respectively; while for male exclusive former smokers the HRs are 1.01 (95% CI: 0.7, 1.46), 1.45 (95% CI: 1.18-1.77) and 1.37 (95% CI: 1.26-1.49), respectively. Mortality HRs for female exclusive current smokers are 1.63 (95% CI: 1.28-2.08), 2.25 (95% CI: 1.96-2.58), and 2.22 (95% CI: 2.07-2.38), respective-



ly; while for female exclusive former smokers, the HRs are 1.12 (95% CI: 0.74, 1.68), 1.43 (95% CI: 1.22-1.68) and 1.42 (95% CI: 1.33-1.5), respectively. HRs for SLT users are only significant for male exclusive current users aged 35-64 years (HR: 2.06, 95% CI: 1.29-3.3). **CONCLUSIONS:** Males and females had similar HRs for both exclusive current and former use through all age groups. Male current exclusive SLT users aged 35-64 had a significant HR. Mortality HRs for female SLT users were not reported due to limited sample size among all age groups. These findings provide updated mortality risk estimates among smokers and SLT users to support regulatory activities.

FUNDING: Federal

POD17-3

STOP: A NOVEL MICROSIMULATION MODEL OF TOBACCO AND NICOTINE USE BEHAVIORS AND OUTCOMES

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Significance: Tobacco policymakers must consider how emerging products will change cigarette smoking behaviors and clinical outcomes. Our objective was to develop, calibrate, and validate a novel individual-level microsimulation model to project cigarette smoking behaviors and associated mortality risks. Unlike most tobacco models, our new model would explicitly include smoking relapse.

Methods: We developed the Simulating Tobacco and Nicotine Outcomes and Policy (STOP) model, in which individuals transition monthly between tobacco use states (current, former, or never) depending on rates of initiation, cessation, and relapse. Simulated individuals face tobacco use-stratified mortality risks. For US women and men, we performed internal validation of the model structure with a Cancer Intervention and Surveillance Modeling Network (CISNET) model. We then incorporated smoking relapse and calibrated cessation rates to reflect the difference between a transient quit attempt and sustained abstinence. We performed external validation with the National Health Interview Survey (NHIS) and the linked National Death Index. Comparisons were based on root-mean-square error (RMSE).

Results: In internal validation, STOP-generated projections of current/former/never smoking prevalence fit CISNET-projected data well (coefficient of variation [CV]-RMSE $\leq 15\%$). After incorporating smoking relapse, multiplying the CISNET-reported cessation rates for women/men by 7.75/7.25, to reflect the ratio of quit attempts to sustained abstinence, resulted in the best approximation to CISNET-reported smoking prevalence (CV-RMSE 2%/3%). In external validation using these new multipliers, STOP-generated cumulative mortality curves for 20-year-old current smokers and never smokers each had CV-RMSE $\leq 1\%$ compared to NHIS. In simulating those surveyed by NHIS in 1997, the STOP-projected prevalence of current/former/never smokers annually (1998-2009) was similar to that reported by NHIS (CV-RMSE 12%).

Conclusions: The STOP model, with relapse included, performed well when validated to US smoking prevalence and mortality. STOP provides a flexible framework for policy-relevant analysis of tobacco and nicotine product use and cessation.

FUNDING: Federal; Academic Institution

POD17-4

A MAGIC BULLET? THE POTENTIAL OF E-CIGARETTES TO DIMINISH THE MORTALITY TOLL OF CIGARETTE SMOKING

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Using a time-tested simulation model, we analyze vaping's potential to reduce smoking-related life-years lost (LYL) in the U.S. to the end of the 21st century. We consider the effects of multiple variables, including the risk of vaping compared to smoking, how much vaping increases smoking cessation, whether youth vaping increases smoking initiation, the issue of who benefits most from vaping (in terms of quitting smoking) - smokers who otherwise have the greatest difficulty quitting, those with average difficulty, or those who have the easiest time quitting - and whether background rates of smoking cessation (i.e., without vaping) rise with age, fall, or do not change. Among the 360 combinations of assumptions, half including the assumption that youth vaping increases smoking initiation, 350 scenarios produced positive findings, generating life-years saved (LYS) ranging from 29,000 to 108 million. Of the 10 cases that produced negative LYS estimates, the resulting LYL ranged from 741,000 to 5.2 million. The analysis strongly supports the conclusion that vaping represents a net public health benefit. That vaping

is no panacea, however, is demonstrated by the fact that the largest gain in LYS represents just 27.3% of smoking-attributable LYL in the complete absence of e-cigarettes. That is, nearly three-quarters of the mortality toll of smoking cannot be avoided by vaping-induced smoking cessation. It is crucially important to understand, however, that much of the future toll of smoking is baked into smoking that occurred in the past, among the now former smokers. We estimate that in the complete absence of vaping, smoking will claim 396 million LYL by 2100. If all smokers had quit smoking entirely in 2015 and no one ever started again, smoking would still be responsible for 211 million LYL by 2100. Thus, the target for tobacco control by 2100 - the loss of life-years that can still be avoided - would be 185 million life-years, just under half (46.6%) of the toll of smoking. We call this target Maximum Potential Harm Reduction (MPHR). The LYS in the various vaping scenarios thus mean that vaping could reduce the toll of smoking by up to 58.6% of the MPHR.

FUNDING: Federal



PAPER SESSION 18: MULTIDISCIPLINARY RESEARCH ON NICOTINE EXPOSURE DURING THE PRENATAL PERIOD

POD18-1

ADDICTION POTENTIAL OF CIGARETTES WITH REDUCED NICOTINE CONTENT IN PREGNANT WOMEN

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Significance: Studies testing the reduction of nicotine content of cigarettes to a non-addictive level have shown promising beneficial effects in the general population of smokers. However, these studies have uniformly excluded pregnant women, who may respond differently considering they metabolize nicotine more rapidly and could be at increased risk for untoward craving/withdrawal or compensatory smoking. To our knowledge, the current study is the first to report on response to reduced nicotine content cigarettes (RNCCs) in pregnant women. **Methods:** A two-site, within-participant study recruited pregnant smokers of low socioeconomic status (maximum of HS degree) to complete experimental sessions after brief smoking abstinence. In Phase 1, participants sampled either usual brand (UB) or one of two RNCCs (0.4 and 2.4 mg/g) under double-blind conditions. Phase 2 directly compared the relative reinforcing effects of the cigarettes by allowing participants to choose which they preferred to smoke. The three possible cigarette dose-pair combinations were tested in separate sessions. Puffs were earned ad-lib by clicking the letter code associated with their preferred cigarette 10x. **Results:** 10 pregnant smokers were enrolled (mean±SD, 30.6±5.2 years old, 15.2±5.0 weeks gestation). Each of the cigarettes significantly reduced MNWS total score and desire-to-smoke. Participants chose the 0.4-mg/g dose less than their UB (22% vs. 78%) during concurrent-choice testing. Positive subjective effects of smoking on the mCEQ decreased by reducing nicotine content. No significant changes indicative of compensatory smoking were noted in smoking topography or breath CO levels. **Conclusions:** Reducing the nicotine content of cigarettes may decrease their addiction potential in pregnant smokers without causing untoward craving/withdrawal or compensatory smoking. Studies of extended exposure to RNCCs in pregnant women are warranted.

FUNDING: Federal

POD18-2

IN SILICO SIMULATIONS FOR NICOTINE EFFECTS ON THE CARDIOVASCULAR SYSTEM OF FETUSES

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Significance: Active and passive maternal smoking are associated with cardiovascular system (CVS) risks in fetuses. To examine the underlying molecular and hemodynamic mechanisms in utero is difficult due to ethical and technical reasons. Instead, a synergy of clinical observations, in vitro experiments and in silico simulations could yield useful insights, and hence may assist early intervention. We aim to develop an in silico fetal CVS model whereby the blood flow in the system can be solved per subject-specific data, such as the vessel lengths and diameters, and clinical ultrasound measurements associated with nicotine exposure be incorporated into the model. **Methods:** An anatomically accurate 3D fetal CVS model of the third trimester is digitized from MRI images. The model consists of major fetal vessels, including cerebral vessels, umbilical vessels, the aorta, venous ductus and vena cava, and hepatic vessels. The governing Navier-Stokes equations for blood flow are solved by using a McCormack numerical scheme. The pressure wave propagation and reflection in the umbilical artery (UA) are modeled in a transmission line. Doppler ultrasound measurements at multiple CVS sites are used as the boundary conditions for the model, and also for validation of the model. The blood pressure data across the CVS system are adopted from several previous clinical studies as reported in the literature. **Results:** With the in silico CVS model we numerically reproduced the blood flow patterns in fetuses, such as the systole to diastole (S/D) ratio and pulsatility index (PI) as measured from Doppler sonography. Nicotine effects on the CVS, such as increased S/D ratio and PI in the UA and the middle cerebral artery (MCA), are also reproduced from the model by applying data from reference range studies for fetal vessels. The blood pressure waveforms and the wall shear stress (WSS) in the fetal CVS system are also simulated from the model. **Conclusion:** We have constructed the world's first 3D anatomically accurate fetal CVS model, and generated blood flow simulations for the model. With the model we were able to provide predictions such as the WSS in blood vessels, the reflection coefficient in the UA, which cannot be measured from clinical routines. Applications of the model include using it

to quantify the blood flow under restricted fetal growth conditions. The model can also be used in conjunction with in vitro mechanistic studies, such as enhanced endothelial nitric oxide synthase (eNOS) level in the UAs of fetuses exposed to maternal smoking.

FUNDING: Nonprofit grant funding entity; Other

POD18-3

THIRDHAND SMOKE CONTAMINATION IN A NEONATAL INTENSIVE CARE UNIT

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Significance: Animal models have associated thirdhand smoke (THS; i.e., tobacco residue in the environment resulting from tobacco use) exposure with impaired wound healing and respiratory development, raising concerns for potential health risks, especially for newborns exposed to THS while hospitalized in a neonatal intensive care unit (NICU). Our primary aim was to characterize THS contamination in a large, urban NICU by measuring nicotine levels on furniture and non-staff parents/visitors' fingers and infant urinary cotinine levels. **Methods:** All non-staff visitors in the NICU, regardless of household smoking, were eligible for participation if they spoke English; and, individuals from households with ≥1 individual who smoke(s) were over recruited. Participants (n=210) gave a carbon monoxide breath sample, and participants completed a brief interview about personal and household smoking/vaping and other participant characteristics. Randomly selected participants were asked to complete a finger-nicotine wipe sample. A subset of infants' mothers (n=80) consented to collection of infant urine (urine sample obtained on or after postnatal day 5) and a nicotine surface wipe of furniture in the infants' rooms. Bayesian generalized linear modeling evaluated nicotine and cotinine outcomes as functions of personal and household characteristics (e.g., living with a smoker, amount of household smoking). **Results:** Measurable levels of nicotine were found on 62.7% (n=42) of visitors' fingers and 93.8% (n=75) of couches/chairs found in infants' NICU rooms. Measures of household smoking and vaping (e.g., smoking ban status, e-cigarette use) were strongly associated (posterior probability ≥95%) with elevated finger and furniture nicotine, as well as infant cotinine. Measurable infant urine cotinine levels were also found in an overwhelming majority of infants (n=73; 93.6%), regardless of household smoking and source of infant food (e.g., formula vs. breastmilk). **Conclusions:** This is one of the first studies to explore THS in a highly protected, smoke-free hospital setting with a vulnerable pediatric population. We demonstrated that THS was transported on the skin of visitors, NICU-based furniture was contaminated, and infants were exposed while hospitalized. Further characterizing routes of THS exposure, exposure levels, and potential health risks (e.g., on the microbiome) are critical steps for research on infants potentially facing greater risks from THS.

FUNDING: Federal; Nonprofit grant funding entity

POD18-4

MODELING ETIOLOGY OF SMOKING DURING PREGNANCY IN SWEDISH TWINS, FULL- & HALF-SIBLINGS, REARED TOGETHER AND APART.

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Significance: Using Swedish nationwide registry data, we investigated the contribution of genetic and environmental risk factors to the etiology of smoking status across stages of pregnancy with increasing degrees of social and psychological pressure to reduce or quit smoking, by twin and sibling modeling. **Methods:** Smoking status data was available prior to pregnancy and during early and late pregnancy. Twin, full sibling, and half sibling pairs, both reared together and apart, born prior to 2000 were obtained from national twin and genealogical registers. Genetic structural equation modeling in OpenMx was applied to the population-based data on smoking status from the medical birth register, to estimate shared genetic and/or environmental covariance across stages of pregnancy, accounting for maternal birth cohort and age at pregnancy effects. **Results:** Analyses of data on twin, full and half-sibling pairs (N~200k pairs, ~280k individuals with assessments of smoking) suggested that risk factors for smoking status changed across stages of pregnancy (before, early and late) while accounting for maternal birth cohorts, age at pregnancy, relative type and rearing status. Results predicted substantial heritability (60-70%) and moderate contributions of shared environmental factors (10-15%) for smoking status. Whilst the same shared environmental factors were amplified



from before pregnancy to late pregnancy, new primarily unique environmental factors explained ~10% of the variance during early pregnancy which was carried forward to late pregnancy. **Conclusions:** Using registry data in women across pregnancy, we replicated that smoking status is highly heritable. Furthermore, we found support for increased impact of shared environmental factors already present prior to pregnancy, and an independent set of mostly unique environmental factors that appear to be triggered by increased social pressure to reduce or quit smoking during pregnancy.

FUNDING: Federal

POD18-5

BIRTH OUTCOMES ASSOCIATED WITH E-CIGARETTE AND NON-E-CIGARETTE TOBACCO PRODUCT USE DURING PREGNANCY: AN EXAMINATION OF PATH DATA WAVES 1 THROUGH 3

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E-cigarettes are the second most prevalent tobacco product used during pregnancy following cigarettes. Pregnant women who smoke cigarettes often find it challenging to quit and may be drawn to e-cigarettes due to the perception that they are a less risky alternative of nicotine delivery. Despite the rapid proliferation of e-cigarette use in the US, there is limited data on the health impact of prenatal e-cigarette use on birth outcomes. Data from the Population Assessment of Tobacco and Health (PATH) Study were used to examine the associations of past 30-day e-cigarette and tobacco use among pregnant women in Waves 1 and 2 on pregnancy outcomes (low birth weight, birth defect, placenta previa, placenta abruptions, or pre-eclampsia) and birth outcomes (miscarriage, abortion, ectopic or tubal pregnancy, stillbirth) at Waves 2 and 3. For analytic models, due to small sample size of exclusive past 30-day e-cigarette users, past 30-day tobacco use was categorized as e-cigarette use with or without other tobacco use, non-e-cigarette tobacco use, and no past 30-day tobacco use. Weighted bivariate and multivariable models adjusting for demographics (age, race/ethnicity, education) examined associations between use behavior and outcomes. Less than 1% of currently pregnant women reported past 30-day exclusive e-cigarette use with no other tobacco products, 4% used e-cigarettes and at least one other tobacco product, 14% reported past 30-day non-e-cigarette tobacco product use, and 82% reported no past 30-day use. In bivariate models, past 30-day use of e-cigarettes (with or without tobacco) increased the odds of an adverse pregnancy outcome (compared to no past 30-day use), but not an adverse live birth outcome. Past 30-day non-e-cigarette tobacco use increased the odds of both an adverse pregnancy and a live birth outcome. In multivariable models, past 30-day non-e-cigarette tobacco use, but not past 30-day e-cigarette use, increased the odds of an adverse pregnancy outcome. Information could help clinicians educate pregnant patients about potential harms associated with e-cigarette use.

FUNDING: Unfunded

PAPER SESSION 19: MARKET AND SALES IMPACTS ON FLAVORED NICOTINE USE

POD19-1

FACTORS ASSOCIATED WITH CHANGES IN FLAVORED TOBACCO PRODUCTS USED: FINDINGS FROM WAVE 2 (2014-15) AND WAVE 3 (2015-16) OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Background: Flavored non-cigarette tobacco product use is widespread in the U.S. The availability of flavor options could be playing a role in recent increases in use, especially for non-cigarette products among youth and young adults. Little is known about specific flavor preferences of youth and adult flavored tobacco users, as well as how preferences may change over time and the impact those changes may have on flavor switching and other tobacco use behaviors. **Methods:** This study analyzes PATH Study data from Wave 2 (2014-15) and Wave 3 (2015-16) youth (12-17 years), young adult (18-24 years), and adult (25+ years) interviews to estimate the prevalence, overall and by flavor category, of flavored non-cigarette tobacco use. We assess flavor switching by examining changes between flavor categories, and characteristics of those who switched flavor between waves. **Results:** In all age groups, and at both waves, past 30-day e-cigarette, cigar, cigarillo, and hookah users reported fruit as their most frequently used flavor category. At Wave 3, a higher percentage of youth (53.6%) and young adults (49.9%) used candy/sweet-flavored e-cigarettes in the past 30 days than adults (39.2%). From Wave 2 to Wave 3, a greater percentage of adults compared to youth reported no change in the number of flavor categories used for each tobacco product type. Youth e-cigarette users (18.3%) were more likely than young adult (13.8%) and adult (11.3%) e-cigarette users to report changing from a single flavor to multiple flavors between waves. Among both youth and adults, the odds of reporting a change in flavor category was highest among younger users, and decreased with increasing age. **Conclusions:** Flavored tobacco use is prevalent across non-cigarette tobacco products. Over a recent two-year time period, using multiple flavor categories and changing flavor category is more prevalent among younger tobacco users, while stability in the number of flavor categories used as well as specific flavor category reported is higher among adult tobacco users.

FUNDING: Federal

POD19-2

ASSOCIATION OF "FLAVORS," "AFFORDABILITY," AND "PROMOTIONS" AS REASONS TO USE CIGARS ON SUSTAINED CIGAR USE AMONG YOUNG PEOPLE (15-24 YEARS-OLD) IN THE US

Lauren Czaplicki, PhD. Schroeder Institute at Truth Initiative.

Youth cigar use in the US has increased in recent years. Cigars are available in flavors and often at discounted prices, which can influence youth use. Exploring the role of flavor and price on cigar use over time can inform regulations to reduce the appeal of cigars to young people. Data were from a large online, nationally representative longitudinal cohort (ages 15-24 at baseline). In this study, three timepoints were used for analysis [T1 (Jan-Apr 2017); T2 (Feb-May 2018); T3 (Feb-May 2019)]. The analytic sample (n=460) was restricted to ever cigar users at T1 or T2. Participants were asked to rate the importance of the following reasons for cigar use (1="Not important" to 5="Very important"): come in flavors I like (flavors); more affordable than cigarettes (affordable); and better store promotions (promotion). The outcome of interest was current cigar



use, defined as use on =1 of the past 30 days. Three adjusted logistic regressions models assessed the effect of each reason to use (flavors, affordable, promotion) at T1/T2 on odds of current use at T2/T3 among those who were ever, non-current cigar users at T1/T2. All models controlled for demographic and psychosocial variables. Each unit increase in the importance of flavor as a reason to use was associated with 1.28 greater adjusted odds (95%CI:1.11-1.48) of current use at T2/T3. Results were similar for models that included affordable (aOR=1.28;95%CI:1.09-1.50) and promotion (aOR=1.32;95%CI:1.09-1.59). Younger versus older age and identifying as Non-Hispanic (NH) African American versus NH White were significantly associated with greater odds of current use at T2/T3 in each model. Peer cigar use was associated with twice the odds of current use at T2/T3 in the flavor and promotion models, but not affordability. Controlling for individual factors, flavor and price play a role in later current cigar use among young, non-current users. Peer use, younger age, and NH African American race also contributed to current use, highlighting the role of social norms and potential targeted marketing by race and age. Regulations to restrict flavored cigar sales and discounting may reduce cigar use among young people.

FUNDING: Other

POD19-3

INEQUITABLE DISTRIBUTION OF FLAVORED TOBACCO PRODUCT MARKETING BY NEIGHBORHOOD CHARACTERISTICS: EVIDENCE FOR TARGETED MARKETING?

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Introduction. Flavored tobacco products are used widely among young people and racial/ethnic minority populations, but few studies have examined the retail distribution of flavored tobacco marketing beyond menthol cigarettes. This study created geographic-based predictions about marketing of flavored tobacco overall, cigarettes, cigars, e-cigarettes and smokeless tobacco in stores across Washington, DC neighborhoods. We examine neighborhood-level demographic correlates of the amount of flavored and non-flavored point-of-sale tobacco marketing. **Methods.** The study conducted comprehensive photographic audits of interior and exterior tobacco marketing in 96 Washington, DC-based tobacco retail locations visited by 149 young adult respondents between 2018-19. Using data on overall and product-specific tobacco marketing, we created a predictive surface of overall and product-specific tobacco marketing and projected the average predicted amount of marketing at the census-tract level. Using Poisson regression analyses, we examined neighborhood demographic correlates (race/ethnicity, family poverty, and youth population) of flavored and non-flavored tobacco marketing. **Results.** Results indicated that the predicted amount of non-flavored tobacco product ads and displays were more broadly distributed with little variability (Range 11.65-11.80). Flavored marketing overall was more widely distributed with a broader range (Range 5.34-17.29). Overall flavored marketing and flavored cigar marketing, were more prevalent in neighborhoods with higher percentages of African-American residents. Non-flavored marketing overall and by product did not differ by neighborhood demographic characteristics. **Conclusions.** This study provides evidence of disproportionate distribution of flavored tobacco marketing in African-American neighborhoods, especially for flavored cigars, at the point-of-sale. Policies that restrict the sale of flavored tobacco may enhance health equity.

FUNDING: Federal

POD19-4

THE IMPACT OF POINT OF SALE FLAVOURED TOBACCO RESTRICTIONS AND PRICE DISCOUNTING ON YOUTH TOBACCO USE

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Significance: In January 2013, Providence, Rhode Island became the 1st US to restrict tobacco price discounting and multi-pack offers and the 2nd city to limit the sale of flavored tobacco products (excluding menthol). Lack of sustained funding for enforcement has been challenging. A two-year CDC grant awarded to the Rhode Island Department of Health in 2017 funded rigorous enforcement of Providence's policies using compliance check forms tailored to the city's policy and penalty structure. The impact of local POS tobacco policies on youth smoking is limited. **Methods:** Between November 2017 and July 2018, undercover police officers conducted 166 compliance check inspections for tobacco sales to minors, 507 compliance checks for sales of flavored tobacco to adults, and 47 compliance checks for tobacco price discounting. Retail tobacco stores were randomly selected from the Rhode Island Taxation List. Stores found to violate the policy were checked more than once. Data on adolescents' current use of tobacco

products were obtained from the 2016 and 2018 Annie E. Casey Evidence2Success Youth Experience administered in Providence's 8 public high schools (spring semesters). Overall differences between survey years were determined by one-way analysis of variance, by α of 0.05, and by overlapping 95% confidence intervals. Data were analyzed using SAS 9.4. **Results:** 8 stores were cited for selling tobacco to a minor, 1 store received a warning, 1 store received a fine of \$250, and 2 stores have cases pending. Of the 73 stores cited for flavor sale violations, 57 stores were fined between \$250 and \$500. None of the 10 stores cited for redeeming a price discount for cigarettes have had their cases adjudicated. FDA inspectors conducted 496 undercover inspections of Providence tobacco retailers over the 2-year grant period citing 46 stores for tobacco sales to minors. The percentage of Providence high school students who reported currently using e-cigarettes was significantly higher in 2016 (baseline) than in 2018 (during implementation). 2016: 13.3% [95% CI: 11.4-15.1]; 2018: 6.6% [95% CI: 5.3-7.8]. Current use of cigars/cigarillos also declined (2016: 7.1% [5.7-8.5]; 2018: 1.9% [1.8-2.6]). **Conclusion:** To our knowledge, this is the first study to present how local and FDA compliance check inspections of tobacco retailers impact youth uptake of tobacco. Taken together, the results of this study support the conclusion that policies that restrict the sale of flavored tobacco products reduce the availability and use of these products by adolescents.

FUNDING: Federal

POD19-5

USING THE EXPERIMENTAL TOBACCO MARKETPLACE TO ASSESS POTENTIAL EFFECTS OF A MENTHOL CIGARETTE BAN ON ALTERNATIVE TOBACCO PRODUCT PURCHASING

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Introduction: Previous surveys report that many menthol smokers say they would quit if menthol cigarettes were banned. However, menthol smokers could also switch to alternative products like menthol little cigars and cigarillos (LCCs). The purpose of this study was to examine alternative product purchasing under conditions simulating a menthol cigarette ban, and to determine how the availability of menthol LCCs affected purchasing. **Methods:** Menthol cigarette smokers (N=40; M=38 years old (SD=13); 30% non-white; 43% female) completed the Experimental Tobacco Marketplace (ETM) task in two study sessions. During both sessions, cigarettes, LCCs, smokeless tobacco, vapes, and medicinal nicotine were available from an online store, and the price of menthol cigarettes increased while the prices of the alternative products remained constant. At the highest menthol cigarette price, participants were unable to afford menthol cigarettes, simulating a ban. Menthol LCCs were available in one session and excluded in the other session. Linear mixed-effects models compared the amount of combusted tobacco purchased at the highest menthol cigarette price under each condition with race, gender, and session order included as covariates. Cross-price elasticities (i.e., slope of linear regression line) were generated to determine substitution products. **Results:** When menthol LCCs were available, non-white smokers purchased significantly more combusted tobacco (687.3 mg nicotine) compared to when they were not available (83.17 mg; $p < .05$). White smokers purchased similar amounts of combusted tobacco regardless of condition (377.3 vs 396.0 mg). Non-menthol cigarettes ($\beta = 0.65$, 95% CI = 0.34, 0.96), menthol LCCs ($\beta = 0.39$, 95% CI = 0.08, 0.70), and menthol vapes ($\beta = 0.26$, 95% CI = 0.16, 0.35) significantly substituted for menthol cigarettes. Menthol vapes were the most frequently purchased product with over two-thirds of participants buying them, regardless of condition. **Conclusions:** Banning menthol cigarettes could result in smokers switching to non-combusted menthol products. Extending the flavor ban to include LCCs could reduce combusted product purchasing, especially among non-white smokers.

FUNDING: Federal

POD19-6

SALES OF TOBACCO-DERIVED NICOTINE POUCHES, UNITED STATES, 2016-2018

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Significance: The landscape of tobacco products in the U.S. is continually and rapidly evolving. New tobacco products marketed as tobacco-derived nicotine pouches entered the U.S. marketplace around 2016. These pouches, which are held in the mouth and available in fruit, coffee, and mint flavors, contain tobacco-derived nicotine salts in non-tobacco fiber pouches. The tobacco in-



dustry has recently entered the tobacco-derived nicotine pouch market, but the extent of sales and use of these products in the U.S. is currently unknown.

Methods: Using retail scanner data from the Nielsen Company during 2016-2018, we assessed unit and dollar sales of tobacco-derived nicotine pouches sold in convenience stores and other retail channels, including food, drug, mass merchandise, and dollar stores; and military commissaries. Data do not include purchases from the Internet, tobacco specialty stores, or vape shops. Dollar and unit sales in the U.S. were assessed by brand, and trends were analyzed using Joinpoint regression.

Results: Unit sales of tobacco-derived nicotine pouches increased during 2016-2018 ($p < 0.05$); unit sales were 154,129 in 2016, 2,884,589 in 2017, and 10,200,756 in 2018. Annual dollar sales for the category also increased ($p < 0.05$), from nearly \$642,000 in 2016, to \$13.9 million in 2017, to more than \$52 million in 2018. By brand, tobacco-free nicotine pouches entered U.S. retail stores in the third quarter of 2016 for brands ZYN and *on!* and in 2018 for brand Dryft. In 2018, market share as a proportion of total dollar sales for the category was as follows: ZYN (89.5%), *on!* (9.2%), and Dryft (1.3%).

Conclusions: Sales of tobacco-derived nicotine pouches are increasing in the U.S. and represent a small but dynamic segment of the tobacco product landscape. Understanding sales and patterns of use of these products can inform regulatory strategies to minimize population level risks, especially for young people.

FUNDING: Unfunded; Federal

**PODIUM PRESENTATION 5****PAPER SESSION 20: ADVANCING OUR UNDERSTANDING OF NICOTINE SELF-ADMINISTRATION****POD20-1****NICOTINE VAPOR SELF ADMINISTRATION: DEVELOPMENT AND VALIDATION OF A NOVEL PROCEDURE IN RODENTS**

Valeria Lallai, Angélique Nicole Cortez, Christie Fowler. UCI, Irvine, CA, USA.

Background: The e-cigarette and vape market has dramatically increased in recent years. This represents a significant concern given the proportion of these users who had not previously used tobacco cigarettes. E-cigarettes vaporize a solution typically composed of nicotine, propylene glycol and/or glycerin. Other factors, such as sex and age, also play an important role in determining responses to drugs of abuse. Given this, we sought to develop a protocol for vaporized nicotine exposure in rats to provide a basis to better understand the differing effects of this exposure route on brain function and dependence-related behaviors. **Methods:** Vaporized nicotine inhalation was compared to intravenous nicotine self-administration, the current procedure most commonly accepted as having high translational relevance to the patterns of nicotine intake found in humans. After optimizing the dose and exposure parameters, male and female Wistar rats were examined in three groups: (1) intravenous nicotine self-administration, (2) passive vapor nicotine exposure, and (3) vapor nicotine self-administration. Following nicotine sessions, blood samples were collected to assess the level of cotinine, the main metabolite of nicotine. Further, subjects were also examined in an open-field to assess nicotine-mediated differences in locomotor activity. **Results:** We found that exposure to vapor induced similar levels of cotinine as intravenous nicotine self-administration in male rats, indicating that the breathing patterns with vapor exposure led to similar titrated blood levels of drug. Interestingly, a differential effect was found in the female rats, in which the same conditions of vapor exposure led to decreased cotinine levels with vapor compared to intravenous self-administration. Furthermore, differences in nicotine-mediated locomotion provide additional support for the level of nicotine intake between exposure routes. **Conclusions:** Together, these data validate a protocol for vapor nicotine self-administration in rats, providing high relevance to established techniques in the field. Moreover, these findings further highlight important sex differences in nicotine consumption based on the route of intake. With this foundation, ongoing studies are utilizing this approach to better understand the impact of e-cigarettes on health and processes underlying nicotine dependence. Supported by the TRDRP (T30FT0967 to VL), the NIH (GM055246 to ANC) and NIDA (NIH DA039658 to CDF).

FUNDING: Federal; State

POD20-2**THE RELATIVE IMPACT OF ACUTE NICOTINE AND TOBACCO ADMINISTRATION ON CRAVING, WITHDRAWAL AND CIGARETTE-SELF ADMINISTRATION IN DEPENDENT AND NONDEPENDENT SMOKERS.**Toni Spinella¹, Sean Barrett¹, Hera E. Schlagintweit². ¹Dalhousie University, Halifax, NS, Canada, ²Centre for Addiction and Mental Health, Toronto, ON, Canada.

Significance: Negative reinforcement mechanisms, wherein individuals smoke at regular intervals to ameliorate craving and withdrawal, are considered integral to persistent smoking. While this is consistent with the behaviour of dependent smokers, it does not fully account for the behaviour of intermittent smokers, who do not smoke frequently enough to maintain steady nicotine levels. This study examined the independent and combined impacts of nicotine and tobacco consumption on cigarette craving, withdrawal symptoms, and subsequent smoking behaviour in 18 non-dependent intermittent smokers and 23 dependent smokers. **Methods:** Participants administered nicotine-containing cigarettes (NC), reduced nicotine content cigarettes (RNC), nicotine inhalers (NI), or nicotine-free inhalers (NFI) across four sessions following overnight abstinence. Participants rated craving and withdrawal before and after product administration, then completed a cigarette self-administration task. **Results:** In dependent smokers NI, NC, and RNC administration resulted in transient reductions in withdrawal, and NC and RNC led to

transient craving reductions. In intermittent smokers, NC and RNC were associated with more persistent reductions in craving. Products did not impact withdrawal, likely due to floor effects. Intermittent smokers self-administered fewer cigarette puffs during the self-administration task than dependent smokers. Across participants, NC, RNC, and NI were associated with fewer self-administered cigarette puffs than NFI. NC and RNC were associated with fewer puffs than NI. **Conclusion:** Findings suggest that intermittent smokers experience minimal withdrawal symptoms, which are not affected by tobacco and/or nicotine consumption. Alternatively, tobacco, regardless of nicotine content, was effective in reducing craving and smoking behaviour across all participants.

FUNDING: Academic Institution; Other

POD20-3**COTININE PRODUCES REINFORCING EFFECTS IN WISTAR RATS**Zheng-Ming Ding¹, Yong Gao², Xiaoying Tan², Alena Sentir². ¹Department of Anesthesiology & Perioperative Medicine, Pennsylvania State University College of Medicine, Hershey, PA, USA, ²Department of Psychiatry, Indiana University, Indianapolis, IN, USA.

Significance: Nicotine (NIC) addiction is devastating to both individuals and society. Limited effectiveness of current medications warrants further research on new targets. Cotinine (COT) is the major metabolite of NIC and commonly used as a bio-marker for NIC usage. COT is behaviorally and biologically active. However, it remains unknown whether COT can contribute to NIC reinforcement. The objectives of this study were to examine potential reinforcing effects of COT and compare its effects to NIC. **Methods:** Adult male Wistar rats were divided into 9 groups with each group (n=8-14/group) receiving one of the following solutions for intravenous (i.v) self-administration (SA): saline, COT or NIC (both at 0.0075, 0.015, 0.03, or 0.06 mg base/kg/infusion). Daily sessions were conducted at FR1 during weeks 1 to 3, FR2 during week 4 and PR during week 5. Numbers of infusion were averaged from the week 3 of FR1 and the week of FR2 and the week of PR. **Results:** During both FR1 & 2, COT at doses greater than 0.0075 and NIC at all doses induced significantly greater infusions than saline (e.g., FR1: 41 vs 33 vs 10 and FR2: 36 vs 21 vs 7 for 0.015 NIC vs 0.015 COT vs saline, $p < 0.05$). COT induced dose-dependent increase (e.g., 15 vs 29 for 0.0075 vs 0.06, $p < 0.05$), but NIC induced dose-dependent decrease (e.g., 47 vs 31 for 0.0075 vs 0.03, $p < 0.05$) of SA during FR2. NIC induced more infusions than COT at 0.0075 during FR1 and at both 0.0075 and 0.015 during FR2. For PR sessions, COT at 0.0075, 0.03 and 0.06 and NIC at all doses produced greater breakpoints than saline (e.g., 9 vs 7 vs 4 for 0.0075 NIC vs 0.0075 COT vs saline, $p < 0.05$). In addition, NIC induced greater breakpoints than COT at both 0.03 and 0.06 (e.g., 13 vs 10 for 0.06 NIC vs 0.06 COT, $p < 0.05$). **Conclusions:** These results indicate that COT supported i.v. SA and produced different SA patterns than NIC. The differences between NIC and COT appeared to depend on doses and reinforcement schedules. In general, the reinforcing effects of COT appeared to be less robust than NIC. These results suggest that COT can produce its own reinforcing effects and may contribute to NIC reinforcement. (Supported by DA044242).

FUNDING: Federal

POD20-4**NICOTINE INDUCES DIFFERENTIAL MOLECULAR AND CELLULAR LEVEL STRUCTURAL CHANGES ACROSS DIFFERENT BRAIN REGIONS**

Chris Richards. University of Kentucky, Lexington, KY, USA.

Chronic exposure to nicotine has been shown to result in cell type specific changes in nicotinic receptor (nAChR) assembly, functional activity, and receptor expression. Single-molecule studies using heterologous expression in isolated cellular systems have provided insight into the mechanism of nicotine induced changes in nAChR stoichiometry, however these often lack the context of the complex environment present in an animal. We developed a novel *ex vivo* approach for single molecule studies of nAChR assembly to measure changes in live animals exposed to nicotine. Single molecule measurements of nAChRs extracted directly from animals provide a precise snapshot of the protein profile at specific time points. We demonstrated the application of this approach to understand the influence of nicotine exposure on the assembly of membrane receptors in the brain of a mouse. Low dose nicotine (0.7mg/kg/hr) led to marginal levels of upregulation across several brain regions but only altered the stoichiometric assembly of $\alpha 4\beta 2$ nAChRs in the cortex and hippocampus. No change in



stoichiometry was observed in the cerebellum, hypothalamus, midbrain, striatum, and thalamus. While the stoichiometry of $\alpha 4\beta 2$ receptors in the cortex and hippocampus eventually returns to the original population distribution after withdrawal, the process takes much longer for the hippocampus than the cortex. These results point towards differential effects of nicotine on $\alpha 4\beta 2$ receptors across different brain regions. We also examined the effect of chronic nicotine exposure on astrocyte populations in different brain regions. We used a knock-in animals bearing tdTomato labeled astrocytes in combination with tissue clearing techniques and multiphoton imaging to determine changes in structural morphology. Nicotine exposure resulted in distinct changes in the midbrain macrophages not seen in other brain regions.

FUNDING: Federal; Nonprofit grant funding entity

PAPER SESSION 21: VAPING AND LUNG HEALTH: CONTEXT FOR THE LUNG INJURY EPIDEMIC

POD21-1

USER-IDENTIFIED NEGATIVE RESPIRATORY SYMPTOMS ASSOCIATED WITH ELECTRONIC CIGARETTE USE

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INTRODUCTION: ECIG use exposes the respiratory system to an aerosol containing particulate matter, nicotine, and other chemicals, but limited research has examined the negative respiratory symptoms associated with ECIG use. This study examined user-identified negative respiratory symptoms from ECIG use.

METHODS: We used concept mapping, a mixed-method approach, to describe respiratory symptoms associated with ECIG use. In 2019, adult current ECIG users who reported experiencing negative respiratory symptoms from ECIG use completed an online study. Participants from 24 states were recruited from randomly selected Craigslist locations from each of the four U.S. census regions. Participants (n = 49; 46.0% women; mean age = 34.9, SD = 11.5) brainstormed statements that completed the prompt: "A specific negative effect or symptom related to my breathing, nose, mouth, throat, or lungs that I have experienced from vaping/using my e-cigarette is..." Participants sorted a final list of 56 statements into groups of similar content and rated statements on how frequently they had experienced them (1 - Never to 7 - Very often). Multidimensional scaling analysis identified thematic clusters.

RESULTS: We identified eight ECIG use respiratory symptom clusters. From highest to lowest mean rating, the clusters included Mucus and Congestion, Fatigue, Throat Symptoms, Breathing Problems, Mouth Symptoms, Cardiovascular Symptoms, Illness Symptoms, and Nose and Sinus Symptoms. Highly rated (i.e., most common) symptoms included dry throat or mouth, fatigue during physical activity, coughing, shortness of breath, excessive phlegm, and bad taste in mouth. No differences were found in mean cluster ratings between those who smoked less than 100 cigarettes in their lives and those who smoked at least 100 cigarettes in their lives.

CONCLUSIONS: ECIG users identified many negative respiratory symptoms associated with their ECIG use, and many were similar to cigarette smoking symptoms. Future research is needed to assess if these symptoms are associated with other negative health outcomes and if certain ECIG device characteristics or behaviors are associated with these symptoms and outcomes.

FUNDING: Federal

POD21-2

CHANGE IN PREVALENCE OF USING MARIJUANA IN AN E-CIGARETTE: DATA FROM CALIFORNIA

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Significance: An increasing number of youth report using e-cigarettes, and a number of substances can be used in these devices, including marijuana or hash oil. There are a lack of data reporting the prevalence of using marijuana in an e-cigarette among youth populations, particularly in jurisdictions that have recently legalized recreational marijuana. In California, Prop 64 legalized recreational marijuana as of November 2016. The objectives of this study are to (1) measure the change in the proportion of e-cigarette users that report ever using marijuana in an e-cigarette and (2) identify the characteristics of these users following recreational marijuana legalization in California, USA. **Methods:** Using representative, repeat cross-sectional data collected from the 2015-16 and 2017-18 California Student Tobacco Survey, this study identified the change in the proportion of e-cigarette users (ever and past 30-day) that reported ever using marijuana in an e-cigarette. Multilevel logistic regression models identified student-level demographic and behavioral characteristics associated with using marijuana in an e-cigarette among past 30-day e-cigarette users in 2017-18. **Results:** In 2015-16, 26.5% of ever and 43.5% of past 30-day e-cigarette users reported using marijuana in an e-cigarette. By 2017-18, this proportion increased to 42.1% of ever and 57.6% of past 30-day e-cigarette users. Between 2015-16 and 2017-18, the proportion of ever e-cigarette users who reported using marijuana in an e-cigarette increased across all genders, grades, and races/ethnicities. Among current e-cigarette users, using



marijuana in the past 12 months and past 30 days was significantly associated with ever using marijuana in an e-cigarette. **Conclusions:** The proportion of students who reported using marijuana in an e-cigarette increased markedly following recreational marijuana legalization in California. Some subgroups of students experienced greater increases than others. Given the changing availability and social norms with respect to marijuana use, additional longitudinal evidence is required to explore the progression from e-cigarette use to marijuana use.

FUNDING: State

POD21-3

TOBACCO USE AND RESPIRATORY SYMPTOMS AMONG US ADULTS: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Objective: To examine the relationship between tobacco product use and functionally-important respiratory symptoms. **Methods:** Using the PATH Study's nationally representative longitudinal cohort of adults ≥ 18 years ($n=16,387$) in Waves 2-3 (2014-16), excluding those with COPD or other respiratory diseases (RD), ten mutually-exclusive categories of past month tobacco use were assessed: single product use (cigarettes, e-cigarettes [e-cig], cigars, hookah, smokeless [SLT]), multiple product use (cigarettes+e-cigs, combustible only, combustible+noncombustible), former use (any product), and never use (reference). The main outcome, functionally-important respiratory symptoms, was defined by wheezing/nighttime cough. Regression models related product use to symptom intensity at baseline and change over 1-year, adjusting for tobacco use, substance use, medical conditions, and sociodemographics. **Results:** All tobacco categories featuring cigarettes were associated with higher risk for functionally-important respiratory symptoms at baseline (e.g. exclusive cigarette smokers $RR=2.34$ [95% CI, 1.92-2.85]) and worsening symptoms at 1 year ($RR=2.80$ [95% CI, 2.08-3.76]), but exclusive use of e-cigs, cigars, SLT, and hookah were not. Worsening of symptoms was also predicted by cigarette smoking history ($RR=1.07$ [95% CI, 1.02-1.12] for each added 5 pack-years), second-hand smoke exposure ($RR=1.04$ [95% CI, 1.02-1.05] per each added 5 hours/week), and past month marijuana use ($RR=1.53$ [95% CI, 1.22-1.90]). In contrast, exclusive use of e-cigs at baseline and switching from any cigarette use to e-cigs only at follow-up were associated with symptom improvement ($RR=1.64$ [95% CI, 1.04-2.58] and 3.00 [95% CI, 1.60-5.64] respectively). **Conclusions:** Among those with no COPD/RD, cigarette use was associated with functionally-important respiratory symptoms, while exclusive use of other tobacco products was not. Exclusive use of e-cigs was associated with symptom improvement. E-cig findings are based on a small sample and do not imply therapeutic efficacy of e-cigs compared to quitting tobacco. Frequency of product use, which could impact symptom development, should be explored in the future.

FUNDING: Federal

POD21-4

ASSOCIATION OF ASTHMA-RELATED PRODUCTIVITY LOSS WITH CIGARETTE SMOKING AND ELECTRONIC NICOTINE PRODUCT USE AMONG YOUTH IN U.S.

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Significance: Asthma is one of the top reasons for missed school days for U.S. children, but few studies have examined the role of tobacco use. This study examined the association between use of cigarettes and electronic nicotine products (ENP) (e.g. e-cigarettes), and asthma-related productivity loss among youth (aged 12-17) in the U.S. **Methods.** The Population Assessment of Tobacco and Health Study Youth survey ($N=11,045$) was used to estimate a two-part econometric model. In the first-part, logistic regression was used to estimate the probability of having doctor diagnosed asthma in the past 12 months as a function of tobacco use and other covariates among all youth.

In the second-part, multinomial regression was used to estimate asthma-related productivity loss as a function of tobacco use and covariates among youth with asthma. Productivity loss was defined by the question: "In the past 30 days, what is the amount of time your asthma kept you from getting as much done at work, school, or home" and was classified as: none or little of the time, some of the time, and most or all of the time. Tobacco use status was classified as: never tobacco use, current cigarette use and no ENP use, current ENP use and no cigarette use, dual use of cigarettes and ENP, and others. Covariates were sociodemographics, body mass index, and smoke-free home rules. **Results:** 18.9% of youth reported having asthma in the past 12 months. Among these, the prevalence of never tobacco use, current cigarette use, current ENP use, and dual use was 77.4%, 1.0%, 1.0%, and 0.9%, respectively. 6.4% reported productivity loss some of the time and 3.9% reported productivity loss most or all of the time. Compared to never tobacco users, dual users were 1.7 times as likely to have asthma ($p=.06$) and 6.2 times as likely to report asthma-related productivity loss most or all of the time vs. none or little of the time ($p<0.05$), and current cigarette smokers were 5.1 times as likely to report productivity loss some of the time vs. none or little of the time ($p<0.05$). **Conclusions:** Co-use of cigarettes and ENP poses particular risks of having asthma and asthma-related productivity loss for youth.

FUNDING: Federal



PAPER SESSION 22: THE CO-USE OF CANNABIS AND TOBACCO: BIOMARKERS AND BEHAVIOR

POD22-1

CIGARETTE SMOKERS, MARIJUANA SMOKERS, CO-USERS - EXPOSURE TO TOXICANTS

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Background: This cross-sectional laboratory study compares daily cigarette smokers, weekly marijuana smokers, and co-users on exposure to nicotine and smoke-related toxicants. **Method:** Adult co-users ($n=19$), cigarette smokers (CS; $n=18$), and marijuana smokers (MS; $n=16$) provided exhaled carbon monoxide (CO), and completed urinary drug and cotinine screens and questionnaires. Eligible co-users: smoked marijuana ≥ 1 /week; smoked ≥ 5 cigarettes/day (cpd) for the past three months ($M_{age} = 46.6$; $SD = 18.2$, 52.6% female). Eligible CS: negative urinary THC; denied marijuana use during the past three months; and smoked ≥ 5 cpd for the past three months ($M_{age} = 51.2$; $SD = 11.6$, 72.2% female). Eligible MS: smoked marijuana ≥ 1 /week; denied tobacco use during the past three months; and had a NicAlert level < 3 ppm ($M_{age} = 43.8$; $SD = 19.1$, 37.5% female). All eligible participants tested negative for other smoked drugs. Tobacco and marijuana use patterns were analyzed as well as exposure to CO, nicotine (via total nicotine equivalents; TNE), and acrylonitrile (via 2-cyanoethylmercapturic acid; CEMA). First morning urine were collected the day after a marijuana smoking session. **Results:** There were no statistically significant group differences in age, gender, ethnicity, race, education, and employment ($ps > 0.05$). Co-users ($M = 12.5$ cpd, $SD = 4.9$) and CS ($M = 14.5$ cpd, $SD = 7.0$) smoked at similar rates ($p = 0.38$). Co-users ($M = 3.1$, $SD = 1.6$) and MS ($M = 2.9$, $SD = 2.1$) smoked similar rates of marijuana (marijuana times per day; $p = 0.71$). When controlling for gender (between group difference $p < 0.20$), co-users and CS demonstrated significantly higher levels of CO ($p < 0.001$), TNE ($p < 0.001$) and CEMA ($p = 0.005$) than MS, with no differences between co-users and CS ($ps > 0.05$). COppm: co-users $M = 21.4$, $SD = 11.6$; CS $M = 18.8$, $SD = 9.2$; MS $M = 5.7$, $SD = 2.6$. TNE nmol/ml: co-users $GM = 67.5$, range = 15-354; CS $GM = 85.4$, range = 31-326; MS $GM = 0.1$, range = 0.0-1.0. CEMA pmol/ml: co-users $GM = 839.6$, range = 111-5107, CS $GM = 739.9$, range = 224-3590; MS $GM = 343.1$, range = 81-1429. **Conclusion:** Co-users' patterns of use mimic those of CS and MS for each respective substance; however, co-users as a group were exposed to similar levels of toxicants as CS. Additionally, ranges for CO and CEMA among MS indicated that some MS were exposed to similar levels of toxicants as some CS and Co-users. Given the high prevalence of co-use, more research is needed examining exposure to harmful chemicals among this group and it is vital that tobacco studies control for marijuana use.

FUNDING: Federal; Academic Institution

POD22-2

BIOMARKERS OF EXPOSURE TO NICOTINE AND TOBACCO-SPECIFIC NITROSAMINES IN ADOLESCENT BLUNT USERS

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Significance. Blunt use is common among youth and young adults, especially in black, urban and male populations, however little is known about the exposure of the user to nicotine and tobacco-specific nitrosamines. **Methods.** 298 urban adolescents were enrolled from a public hospital-based clinic in San Francisco, California. Questionnaires were completed assessing past 30-day product use including blunts, tobacco cigarettes, e-cigarettes and other nicotine/tobacco products. Urines were collected for cotinine (major proximate metabolite of nicotine) and the metabolite 4-(Methylnitrosamino)-1-(3)pyridyl-1-butanol (NNAL), a tobacco-specific nitrosamine biomarker. **Results.** 33 participants had smoked a blunt in the past 30-days; with 45% also using another nicotine/tobacco product. Of the 18 exclusive blunt users, demographics were 56% female; average age=17 years; 45% Hispanic, 34% Black, 11% Asian, 5% Mixed, and 5% White. Cotinine and NNAL levels were significantly higher in exclusive blunt users ($N=18$) vs. non-blunt users ($N=239$), (cotinine geometric mean=3.23 ng/mL vs. 0.16 ng/mL; $t(255)=5.07$, $p<0.001$ and NNAL geometric mean=3.92 pg/mL vs. 0.75 pg/mL;

$t(255)=6.30$, $p<0.001$). **Conclusion.** In this small sample of exclusive adolescent blunt users, cotinine and NNAL levels were similar to those exposed to heavy secondhand smoke and on average lower than regular users of tobacco cigarettes.

FUNDING: Nonprofit grant funding entity

POD22-3

IMPACT OF SMOKED CANNABIS ON TOBACCO CIGARETTE SMOKING INTENSITY AND SUBJECTIVE EFFECTS

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Significance: The majority of US adults who use cannabis also smoke tobacco cigarettes. Most evidence on the co-use of cannabis and tobacco comes from epidemiological surveys, cross-sectional studies, and secondary analyses of clinical trials. The objective of this pilot, placebo-controlled, double-blind, within-subjects human laboratory study was to gather preliminary data on how smoking active vs. placebo cannabis impacts tobacco cigarette smoking behavior, craving, and subjective drug effects. **Methods:** Adult daily cannabis and tobacco co-users ($N=9$) were randomly assigned to two possible experimental visit orders (i.e., active cannabis (5.6% THC) first visit and placebo cannabis second visit, or vice versa). Participants smoked one cannabis cigarette, and approximately 30 minutes later, were given a 5-minute *ad libitum* period to smoke one of their own brand of tobacco cigarette. **Results:** The sample was mostly African American and relatively evenly split with regard to sex (5/9 male); mean (M) age was 35.2 years (standard deviation (SD)=8.5). As expected, boost in plasma THC levels (difference between pre- and post-cannabis smoking) differed between active and placebo cannabis conditions (active boost: $M=57.4$ ng/mL; $SD=35.5$ vs. placebo boost: $M=0.01$ ng/mL; $SD=0.77$). Tobacco cigarette puff topography measures - the primary outcome of the study - and tobacco craving did not differ between active and placebo cannabis conditions. After smoking active vs. placebo cannabis, the item for "liking" the effects of the tobacco cigarette was significantly higher at 60, 90, and 120 mins and for "feeling good effects" was significantly higher at 90 mins (active: $M=37.8$; $SD=11.3$ vs. placebo: $M=11.3$; $SD=4.5$)(all $ps<.05$). **Conclusion:** Among adult daily co-users of cannabis and tobacco cigarettes, smoked cannabis enhanced some markers of the abuse liability of tobacco cigarettes though not smoking behavior. This small study presents a potential mechanism underlying the strong epidemiological overlap between use of cannabis and use of tobacco - that the endocannabinoid system may mediate the rewarding properties of nicotine.

FUNDING: Federal; Other

POD22-4

BLUNT VS. NON-BLUNT CIGAR USE IN AFRICAN AMERICAN YOUNG ADULTS WHO ALSO SMOKE CIGARETTES: A MIXED METHODS ECOLOGICAL MOMENTARY ASSESSMENT

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Significance: The use of cigars altered to contain marijuana (blunts) contributes to nicotine addiction and toxicant exposure, but factors associated with blunt vs. unaltered cigar (non-blunt) smoking have not been fully examined. We used ecological momentary assessment (EMA) and in-depth interviews (IDIs) to examine factors associated with blunt vs. non-blunt use among African American young adult (18-29 years) dual users of cigarettes and cigars. **Methods:** For 14 days, 63 participants recorded their smoking, craving, emotions, location, and social setting via an SMS-based EMA system. Afterward, we conducted IDIs to discuss reasons for cigar smoking and cigar type preferences. Generalized estimating equations modeled the odds of blunt vs. non-blunt smoking as a function of EMA and baseline (e.g., age) factors. We conducted framework thematic analysis of coded transcripts to compare reasons for use and preferences for blunts vs. non-blunts. **Results:** Men and older young adults (25-29 years) had greater odds of blunt smoking. Being with others was associated with greater odds of blunt smoking. Alcohol-flavored cigars had lower odds and sweet-flavored cigars had greater odds of being used as blunts than plain cigars. Participants described both blunts and

**PAPER SESSION 23: DESCRIPTORS,
CLAIMS, AND COLORS AFFECT
CONSUMER PERCEPTIONS****POD23-1****ADOLESCENTS' HEALTH PERCEPTIONS OF NATURAL
AMERICAN SPIRIT'S ON-THE-PACK PRO-ENVIRONMENT
CAMPAIGN**

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SignificanceNatural American Spirit (NAS) cigarettes, marketed as an eco-friendly, natural alternative to other brands, have grown in popularity, even as US smoking prevalence is declining. Despite the well-documented environmental harms of tobacco production, NAS cigarette packs feature a "Respect for the Earth" campaign, with a faux recycling image of green tobacco leaves and the logo for the Programme for the Endorsement of Forest Certification (PEFC). **Methods**Using a randomized survey design with a sample of US adolescents (ages 13-17, N=1003) from Qualtrics, this study evaluated perceptions of NAS pro-environment cigarette packs relative to Pall Mall packs. An online survey showed the front, back, and sides of NAS and Pall Mall packs (both owned by Reynolds American), which were matched on pack color (blue, green, or orange/gold). All participants rated both brands (order was randomized) and one of three pack colors (also randomized). Primary outcomes were health-oriented perceptions of the brands for self, a smoker, others, and the environment. **Results**The sample was 75% female and 34% ever used a tobacco/nicotine product. Controlling for brand order and pack color, NAS cigarettes were perceived as less addictive, healthier for the smoker, others, and the environment compared to Pall Mall cigarettes (p 's < .01). When asked about the meaning of the NAS tobacco leaf and PEFC logos, 90% of adolescents provided a nature-friendly word (e.g., environment, trees, recycle). Such responses were also associated with perceptions that NAS was less harmful for health and the environment. Findings did not differ by ever versus never tobacco or nicotine product use. **Conclusion**Extending our prior research with adults, adolescents perceived a health advantage for Natural American Spirit cigarettes with its on-the-pack pro-environment marketing. Given these consumer misperceptions, eco-friendly messaging on cigarettes, a product known to be enviro-toxic and harmful to health, should be prohibited.

FUNDING: Federal; Academic Institution

POD23-2**YOUNG ADULTS' PREFERENCE FOR LITTLE CIGARS AND
CIGARILLOS IN RESPONSE TO PACKAGING FEATURES, A
DISCRETE CHOICE EXPERIMENT**

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Objective: We conducted a discrete choice experiment (DCE) among young adult cigarette smokers in July-August 2018 to examine their preference for cigarillos, in response to various packaging attributes including flavor and flavor description, quality descriptors, pack size, and prices. **Recruitment:** A convenience sample of 566 US young adult cigarette smokers aged 18-34, among whom 296 were past 30-day little cigar and cigarillo (LCC) smokers, were recruited using Facebook ads and invited to participate an online tobacco survey hosted on Qualtrics, which contains DCE and tobacco use questions. For the DCE, participants were asked to choose among two cigarillo products or "neither of these" (opt-out). **Results:** Choices analyzed using multinomial, nested, and random parameter logit models showed that young adult cigarette smokers prefer grape over menthol, tobacco/regular, and sweet flavors, prefer "color only" and "color and text" flavor depictions over a text only depiction, prefer "smooth" and "sweet" quality descriptors over the "satisfying" quality descriptor, and prefer larger pack sizes and lower prices. The marginal willingness to pay (WTPs) for larger pack sizes, packages with color depiction of flavors, and packages with color and text depiction of flavors are \$1.07, \$0.45, and \$0.66, respectively. The marginal WTPs to avoid menthol, tobacco/regular, and sweet flavors, in order to choose grape flavor, are \$0.49, \$0.57, and \$0.43, respectively. The marginal WTP to avoid "satisfying" quality descriptor, in order to choose smooth or sweet ones, is \$0.26. **Conclusion:** Results suggest that regulating product

non-blunts as ideal for use socially and while relaxing. Unaltered little cigars, but not unaltered cigarillos or blunts, were described as good cigarette substitutes. For both blunts and non-blunts, participants described lower cost, taste/smell, strength, and social acceptability as major influences when deciding what cigar to smoke. However, the wrapper and slow burn were especially important for blunts, whereas flavor was especially important for non-blunts. **Conclusion:** With an increasing number of states legalizing recreational marijuana use and increasing cigarette costs, African American young adults are at high risk for increasing their use of blunts and non-blunts. The results increase our understanding of the overlapping and distinct risk factors for blunt and non-blunt use, and lend support for policies (e.g., flavor ban, higher cost) and behavioral interventions to mitigate the risk in this high-priority group.

FUNDING: Federal; Academic Institution

POD22-5**INITIATION, AND INTENTION TO QUIT LITTLE CIGARS AND
CIGARILLOS AND BLUNT USE AMONG MINORITY YOUNG AND
MIDDLE-AGED ADULT POPULATION**

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Background: Members of racial/ethnic minority remain at high risk for tobacco use and suffer disproportionately from smoking-related diseases. Evidence suggests that concomitantly use of little cigars and cigarillos (LCCs) with cigarettes may increase their risk of chronic illnesses and addiction. Smoking cessation plays a critical role in reducing this gap, and therefore, it is vital to understand the correlates of cessation to help design effective tobacco control policies. This study examines role of age of initiation and concomitant use of LCC and its subtypes including LCC-tobacco, LCC-blunt, and LCC-poly use, which includes use of both LCC-tobacco and LCC-blunt on quit intention among the ethnic minority population. **Methods:** Data from a national probability sample of black/African American, Hispanic/Latino, and white cigarette smokers aged 18-44 (n = 1018) were analyzed. Weighted estimates were used to assess current LCC-cigarette, LCC-blunt, and LCC-poly use behavior. Logistic and multinomial regression models assessed LCC user subtypes, age of initiation, and intention to quit. **Result:** In our sample, about 70% of the cigarette smokers reported trying LCC, blunt, or both. Use of LCC subtype differed in terms of gender, ethnicity, and education. In our sample, cigarette smokers were predominately white (44.4%), LCC-tobacco were predominately black (44.6%), LCC-blunt were predominately Hispanic (58%), and poly users were blacks (46.7%). LCC-blunt users (OR 3.81, 95% CI, 1.6-8.9) and poly users are (OR 3.1, 95%CI 1.5-6.3) compared to cigarette users have higher odds of being 14 years or less during the age of cigarette initiation rather than being 18 or older. Blacks compared to whites have 2.01 (95% CI, 1.241- 3.35) the odds of having low intention to quit. **Conclusion:** This study explored the potential impact of concomitant use of LCC and marijuana use on smoking cessation. Early age of initiation and having low intention to quit among the concomitant user of LCC and ethnic minorities may help clarify characteristics and understand the quitting behaviors among this subgroup with the aim to inform the development of appropriate and effective interventions to help reduce tobacco-related disparity.

FUNDING: Federal



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attributes, including packaging features, could impact LCC choices among young adult smokers in the US. FDA regulation over these packaging features therefore may impact LCC use among young adult smokers.

FUNDING: Federal

POD23-3

CONSUMER PERCEPTIONS OF HEALTH CLAIMS MADE IN VAPE SHOPS

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Background Electronic nicotine delivery systems (ENDS) have been unlawfully promoted as modified risk tobacco products (MRTP), smoking cessation aids, having therapeutic effects, and approved/endorsed by the Food and Drug Administration (FDA). Research is lacking on how consumers perceive these claims that promote ENDS. This study explored consumer perceptions of ENDS claims displayed in vape shops. **Methods** Two trained data collectors conducted observational assessments of vape shops (n=99) in North Carolina and Virginia to document ENDS claims using wearable imaging technology (i.e. glasses that capture photographs). Of the 77 unique claims documented, 28 were included in an online survey of 820 adults, ages 18-65. Current smokers and ever ENDS users were oversampled. Eligible participants were randomly assigned to view six claims and rate the extent the claim was related to cessation (help a smoker quit smoking); MRTP (safer/less addictive/less harmful/fewer harmful ingredients than cigarettes; less risk of tobacco-related disease); therapeutic effect; FDA-approved/endorsed; and substitute for cigarettes. **Results** The sample was 54% female, 62.8% White and 14.4% Hispanic; mean age of 42.9 years (SD=12.9). The sample was 32% current smokers, 34% ENDS users, and 34% non-users. Among all claims, 92.9% were perceived as MRTP; 82.1% as substitution; 42.9% as cessation; 3.6% as FDA-approved/endorsed; and 0% as therapeutic effect. We examined differences by smoking status and found ENDS users perceived more FDA-approved/endorsed, therapeutic effects and cessation claims compared to current smokers and non-users. **Conclusions** Consumers perceived almost all claims documented in vape shops as one of the prohibited claim types. Most claims were perceived as promoting ENDS as a MRTP; about half were perceived as smoking cessation claims, both of which are prohibited without FDA approval. Findings provide critical data on how consumers perceive claims that promote ENDS, which can inform messaging and regulatory action.

FUNDING: Federal

POD23-4

THE DIFFERENTIAL EFFECT OF U.K. AND U.S. POLICY MESSAGES ON E-CIGARETTE PERCEPTION AND USE: A RANDOMIZED CONTROLLED TRIAL

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Significance: Public health communities are still divided as to the best way to communicate the risk and benefits associated with e-cigarette use. For example, the official statements from the U.K. and U.S. health authorities differ significantly: the U.K Royal College of Physicians (RCP) was more positive about the benefit/risk ratio of e-cigarettes than the U.S. Centers for Disease Control and Prevention (CDC). This study examines the effects of these policy messages on risk perception. **Methods:** An online panel of 20,055 adults from 19 major cities in China were randomized into three groups to receive tailored information regarding e-cigarettes. One reflects the viewpoint of UK-RCP and the other the US-CDC's position, with the third serving as the control group. All groups were asked to rate the harmfulness of the regular cigarettes and e-cigarettes on a 1-10 scale (1=not at all harmful, 10=extremely harmful). **Results:** The mean rating for the risk of e-cigarettes does not differ significantly for the UK-RCP message group and the control group (5.42 vs. 5.49, p=0.08), but that for the US-CDC message group was significantly higher than the control group (5.87 vs. 5.49, p <0.001). Interestingly, the risk perception for regular cigarettes also changed. The mean rating for cigarettes for the UK-RCP message group was significantly higher than the control group (8.91 vs. 8.83, p<0.01). There is no difference between US-CDC message group and the control group (8.84 and 8.83, p=0.51). The likelihood of smokers using e-cigarettes to help their next attempt to quit smoking is also significantly reduced for the US-CDC group (60.3%, 53.9%, and 60.1% for UK-RCP, US-CDC, and the control group respectively). **Conclusions:** A more positive message about e-cigarettes does not change the public perception of the risk of e-cigarettes, suggesting the current public view of e-cigarettes (in China) is closer to what is stated in the UK-RCP position. However, a more negative

message increased the risk perception for e-cigarettes. A more negative message also decreased the likelihood of smokers using e-cigarettes to assist their next attempt to quit smoking. **Implications:** Policy messages from health authorities about e-cigarettes can significantly affect the likelihood of whether smokers will use e-cigarettes to aid their attempt to quit cigarette smoking.

FUNDING: Federal; Academic Institution

POD23-5

CHANGES IN MISPERCEPTIONS OF HARM AMONG AMERICAN SPIRIT SMOKERS: RESULTS FROM WAVES 1-3 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY (2013-2016)

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INTRODUCTION: Natural American Spirit (NAS) smokers are considerably more likely than smokers of other brands to believe that their brand "might be" less harmful than other cigarette brands. NAS's use of descriptors such as "natural," "organic," "additive-free," and most recently "tobacco ingredients: tobacco + water," among other aspects of the brand, contribute to these misperceptions. This study examines prevalence of NAS brand preference and NAS smokers' relative perceived harm over three waves of the Population Assessment of Tobacco and Health (PATH) Study from 2013 to 2016. **METHODS:** Data were drawn from the public use files of Waves (W) 1-3 of the PATH Study. Analyses are restricted to adult current established smokers who reported a manufactured cigarette brand preference. Perceived relative harm of one's own brand was assessed with: "Do you think the brand of cigarettes you usually smoke might be less harmful, no different, or more harmful, compared to other cigarette brands?" The item was dichotomized so that 0=less harmful and 1=same or more harmful. Prevalence estimates of NAS brand preference and harm perceptions by wave and odds of harm misperception were analyzed using cross sectional weights. Additionally, we used an unweighted marginalized mixed effects model to examine change in perceived relative harm of own's own brand from W 1-3. **RESULTS:** 2.2% of US adult smokers preferred NAS in 2013-14; 64.3% (57.1, 70.9) of these adults believed their brand might be less harmful than other brands. Similarly, 2.9% of adult smokers preferred NAS in 2015-16, and 54.0% (45.4, 62.3) believed their brand might be less harmful than other brands. Accounting for the multilevel nature of the data, the odds of NAS smokers misperceiving harm decreased (p<0.05) between W 1-3. Still, NAS smokers were over 21 times (p<0.0001; adjusted) more likely than smokers of other brands to misperceive the relative harm of their brand of cigarettes at W3. **CONCLUSIONS:** The proportion of NAS smokers misperceiving the harm of their own brand has decreased, but NAS smokers are still much more likely than smokers of other brands to inaccurately believe their cigarettes are less harmful.

FUNDING: Federal

**PAPER SESSION 24: BACK TO BASICS:
 CRAVING, STRESS, WITHDRAWAL, AND
 REWARD****POD24-1****CUE REACTIVITY AND CRAVING: EVIDENCE FROM A META-ANALYSIS OF CLINICAL OUTCOMES AND A META ANALYSIS OF NEUROIMAGING STUDIES**

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Significance: Cue reactivity and craving have long been considered key contributors to drug use and relapse, however, the magnitude of this contribution has been debated. Further, the neural mechanisms underlying these phenomena have remained unspecified. **Methods & Results:** We performed two quantitative meta analyses. The first meta-analysis included 208 clinical studies and 603 statistics, representing 44,377 drug-using participants. Results show that drug cue exposure, cue reactivity, and craving prospectively and reliably predict drug use and relapse. I will focus on finding from 102 cigarette-smoking studies representing 28,331 participants that prospectively link smoking cues and cigarette craving to subsequent smoking and relapse to smoking, with aggregate effect sizes in the small or medium range (with effect sizes in the medium-to-large range for some sub-analyses). The second meta-analysis included 127 published neuroimaging studies (representing 3971 participants) that identifies the neural systems most consistently linked to cue reactivity and craving across drugs. I will focus on results from the 50 studies summarizing the neural systems underlying cigarette cue reactivity and craving (representing 1360 participants), including in ventral striatum, amygdala, and insula. I will then compare these smoking-specific activations to those associated with cue reactivity and craving for other drugs. **Conclusions:** the results from the first meta-analysis underscore the importance of cue reactivity and craving in substance use disorders, and nicotine use disorder in particular. The imaging meta-analysis highlights that these are psychological constructs with a known neurobiological basis, and can serve as an important treatment target. In this context, I will briefly discuss the regulation of craving (ROC) task, and how we have used it (1) to measure the effects of various regulatory strategies on craving, (2) to study the neural mechanisms underlying such strategies (and modulating targets identified in the meta-analysis), and (3) as the basis of for a new ROC-based intervention that reduces smoking and unhealthy eating.

FUNDING: Federal; Academic Institution

POD24-2**MODELING THE EFFECTS OF AN ACUTE PSYCHOLOGICAL STRESSOR ON VAPING LAPSE BEHAVIOR**

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Rationale: Given the significant impact of negative emotional states (anxiety, negative affect) on the first instance of cigarette during a quit attempt (i.e. a lapse), this study aimed at exploring the effect of stress on lapse and relapse behavior. **Methods:** Participants were 31 e-cigarette users (77% male, average age 19.5) who reported having used an e-cigarette for a mean length of 12.3 months and consuming an average of 3.4 mL of e-liquid daily. Participants attended two laboratory sessions under acute abstinence (≥ 12 hours since their last e-cigarette use) in which they were exposed to the Trier Social Stress Test (TSST) or a non-stress control condition. They subsequently started the choice task involving two periods: 1) delay period (participants had the option of starting vaping or delaying vaping for up to 50 minutes in exchange for money), and 2) self-administration period (participants were given a \$5 tab to purchase e-cigarette uses for 60 minutes). Subjective (craving and stress) and physiological (heart rate) measures were also collected 5 times at each session. **Results:** The amount of time that e-cigarette users were able to resist vaping did not differ between conditions (control=7.6 minutes vs TSST= 10.6 minutes). The number of e-cigarette uses purchased was higher after the TSS compared to the control condition ($p < .01$). Exposure to the stressor also produced significant increases in craving, stress, and heart rate among e-cigarette users ($p < .05$). **Discussion:** This study used a human laboratory model for estimating the effect of stress on lapse and relapse behavior among e-cigarette users. Results showed that exposure to a psychological stressor did not undermine the ability to resist vaping among dependent e-cigarette users (i.e., lapse), but it influenced the

number of uses purchased once users decided to "give in" and vape (i.e., relapse). This study also provides further evidence that human laboratory models are time- and cost-efficient measures to identify the motivational processes underlying e-cigarette use.

FUNDING: Federal

POD24-3**NICOTINE'S DOSE-DEPENDENT REINFORCEMENT ENHANCING EFFECTS MAY DIFFER DUE TO TYPE OF AVAILABLE NON-DRUG REWARD**

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Introduction: In humans, nicotine intake acutely enhances the reinforcing effects of non-drug "sensory" rewards unrelated to nicotine (e.g. visual via video, auditory via music), generally consistent with preclinical research (i.e. lights, tones). Specificity is indicated by general lack of nicotine enhancement of the non-sensory reward of money or no reward (control). Recently, however, we have found potentially different dose-dependent effects of nicotine on enhancing reinforcement depending on the type of sensory non-drug reward (reinforcer). Specifically, responding for video and music are enhanced by a full nicotine cigarette, while video, but not music, is enhanced by lower nicotine intake via NRT patch (14 mg) or Nicotrol spray (2 x 1.0 mg) or e-cigarettes (36 mg/ml). Thus, we conducted a preliminary assessment of the reinforcement enhancing effects of several low nicotine content cigarettes to gauge differential dosing influences on responding for video vs music reward. **Methods:** In a within-subjects design, 33 adult dependent smokers (19 M, 14 F) abstinent overnight were administered Spectrum cigarettes with nicotine contents of 17, 11, 5, 2.3, and 1.3 mg/g, just one per session in counter-balanced order across the 5 sessions, blinded to content. As in our prior studies, all responded on a simple operant task using a PR50% schedule to obtain small units (30-sec clips) of each reward type, available singly on separate 15-min trials. Because we hypothesized less responsiveness to nicotine effects on music vs video, reward order per session was not counter-balanced but fixed to ensure more nicotine prior to music, as responding for video followed the first cigarette and for music followed the second cigarette (4 controlled puffs on each). **Results:** Despite such modest nicotine exposure, responding for the video reinforcer (Wald $\chi^2(4) = 11.45$, $p < .03$), but not for music (Wald $\chi^2(4) = 4.41$, $p = .35$), varied significantly across nicotine content conditions. Follow-ups showed greater responding for video after 4 puffs from the highest nicotine cigarette (17 mg/g) vs those at or below 5 mg/g, while 11 mg/g did not differ from any other cigarette. Even with intake from a total of 8 puffs each session, responding was not enhanced for music reward, as hypothesized. **Conclusions:** Future research should more systematically examine whether nicotine's reinforcement enhancing effects may be differentially sensitive to dose across the types of sensory rewards available. Such enhancement may be another factor helping to maintain persistent nicotine use.

FUNDING: Federal

POD24-4**TIME-VARYING RELATIONS OF OPTIMIZED SMOKING TREATMENT WITH KEY WITHDRAWAL SYMPTOMS EARLY IN THE CESSATION PROCESS**

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Background: A recent randomized control trial demonstrated that optimized, intense, multi-component smoking cessation treatment doubled abstinence rates relative to recommended usual care in primary care settings. Examining when in the pericessation period intense treatment affected tobacco withdrawal symptoms may reveal how intense treatment boosts cessation success. **Method:** 623 adults were randomized to receive either recommended usual care (R-UC; 8 weeks of post-quit nicotine patch, 1 brief counseling session, and quitline referral, $n=315$) or abstinence-optimized treatment (A-OT; 3 weeks of mini-lozenges pre-quit, 26 weeks of nicotine patch plus mini-lozenges, 11 counseling contacts, and 7-11 automated medication adherence reminders, $n=308$). Momentary craving, negative affect, anhedonia, and daily patch and mini-lozenge use were measured 1 week pre-quit through 2 weeks post-quit. Time-varying effect models (TVEM) of treatment condition and within-person patch and mini-lozenge use with craving, negative affect, and anhedonia during the pericessation period were conducted. **Results:** A-OT suppressed pre- and post-quit craving and post-quit anhedonia, relative to R-UC. Negative affect was not improved by A-OT over R-UC. No significant time-varying relations of patch use and withdrawal symptoms were observed. Using more lozenges was associated with greater craving and negative affect in the first few



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days of the quit attempt, and with lower anhedonia 10-13 days post-quit. Craving and anhedonia were predictive of self-reported 7-day point prevalence abstinence at 4 weeks post-quit. **Conclusion:** A multi-component intense treatment reduced craving and anhedonia better than recommended usual care amongst primary care patients who smoked and reduced levels of these withdrawal symptoms predicted later abstinence. Steady state nicotine (the patch) was unrelated to withdrawal symptoms, but ad lib nicotine (mini-lozenge) nicotine use had effects on withdrawal symptoms that varied over the first two weeks of quitting.

FUNDING: Federal

POD24-5

SITUATIONAL FACTORS ASSOCIATED WITH INTERMITTENT SMOKERS' TEMPTATIONS TO SMOKE AND LAPSES DURING QUITTING

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Significance. Non-daily, intermittent smokers (ITS) now comprise about one third of US adult smokers. ITS have difficulty quitting, despite a lack of dependence, yet little is known about the experience of relapse among ITS, which may shed light on the role of dependence in relapse process. We analyzed situational factors associated with temptations to smoke, and whether these resulted in smoking lapses, among ITS engaged in an assisted quit attempt. **Methods.** Participants were 130 ITS who achieved initial abstinence while enrolled in the placebo arm of a smoking cessation study. For up to 6 weeks post-quit, EMA data captured participants' location, activity, social setting, mood, and craving in temptations (k=976), including those that eventuated in lapses (k=147) rather than being resolved without smoking. Background states were assessed through randomly-timed assessments (k=11,446). Participants also reported triggers of temptations, and coping performed to prevent lapses. Multilevel logistic regressions compared temptations to background situations, and lapse episodes to resolved temptations. **Results.** Temptations were marked by exposure to smoking cues, including others smoking, lax smoking restrictions, and alcohol consumption, as well as more negative affect (with ORs ranging up to 10 for some predictors). Lapses did not differ from resolved temptations in craving intensity, but were more often associated with smoking cues and availability of cigarettes, alcohol consumption, and worse affect, and were more often attributed to good moods (ORs up to 40). Both behavioral and cognitive coping responses were very strongly associated with avoiding lapsing, but behavioral coping had much larger effects (ORs up to 100). The effects of affective distress on lapse risk were mediated by its effects on coping. **Conclusion.** Smoking cues play a major role in ITS' temptations and lapses, much as they do for daily smokers. Affective distress also played a role in ITS' lapses, undermining the idea that the affective distress seen in daily smokers' lapses is due to nicotine withdrawal. The data reinforced the important role of coping in preventing lapses.

FUNDING: Federal

PAPER SESSION 25: ROLE OF E-LIQUID PH AND FLAVORS ON NICOTINE INTAKE

POD25-1

NICOTINE ABSORPTION PROFILE AMONG REGULAR JUUL USERS

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Background: JUUL is an electronic nicotine delivery system (ENDS) that has quickly gained popularity since its launch in 2015 and is known to contain a high nicotine concentration liquid (59mg/ml). Concerns are mounting about the rapid increase in use of this potentially highly addictive product, particularly among adolescents, however, there are no independent published data on its nicotine delivery profile. This study aimed to characterize nicotine absorption among regular JUUL users and to evaluate subjective effects related to use. **Methods:** Current adult JUUL users were recruited for the study. All users abstained from cigarette smoking for 4 days (CO verified <8ppm) and from any nicotine containing product for at least 14 hours prior to the visit. Users completed baseline questionnaires including the Penn State Electronic Cigarette Dependence Index (PSECDI) and were asked to rate withdrawal symptoms. Users were then instructed to puff on their own JUUL device (nicotine concentration 59 mg/ml) every 20 seconds for 10 minutes. Blood was collected via catheter at baseline, while vaping (1, 2, 4, 6, 8, and 10 minutes), and after vaping (2 and 5 minutes after the last puff). Users then rated their withdrawal symptoms and side effects. Serum samples were analyzed for nicotine, cotinine, and 3-hydroxycotinine by LC-MS/MS. Outcomes included the maximal concentration (cmax), time to maximal concentration (tmax), and nicotine boost (calculated by subtracting the baseline nicotine level from the cmax). Paired t-tests were used to evaluate within subjects differences in subjective measures. **Results:** Participants (n=6) were a mean age of 37.8 (SD=15.8) years, were 33.3% male, and 83.3% white. The mean cmax was 31.1 ng/ml (SD = 13.2) and the mean tmax was 8.7 minutes (SD = 1.6). The mean nicotine boost obtained was 28.6 ng/ml (SD = 9.8). Participants experienced a significant reduction in anxiety (p=.04) and craving (p=.02) after JUUL use. **Conclusions:** This study is the first to show that JUUL, when used intensively, delivers a higher and faster boost in blood nicotine than has been reported for most other ENDS devices. Compared with studies reporting the nicotine boost obtained after smoking one cigarette, JUUL nicotine delivery is similar. The nicotine delivery capabilities of JUUL may contribute to the addictiveness of the device, as well as its ability to compete with cigarettes for market share.

FUNDING: Academic Institution

POD25-2

EFFECT OF PH OF THE NICOTINE LIQUID ON JUUL PUFFING BEHAVIOR AND NICOTINE UPTAKE

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Background: The recent alarming increase in adolescent and young adult use of electronic cigarettes followed the introduction of pod devices containing liquids with lower pH and 2-10 times higher nicotine concentrations than previously available. "Nicotine salt liquids" are acidic, and thus only a negligible fraction of the total nicotine is present in the unprotonated form, which may make their high nicotine concentrations easier to inhale. To determine if the pH of nicotine salt liquids contributes to the direct and indirect harm of vaping, we examined puffing behavior and nicotine uptake in users vaping two commercial mint-flavored pods. **Methods:** We conducted a pilot single-blind crossover study of 31 experienced JUUL users vaping two nicotine salt pods using a JUUL device *ad libitum* in two 30-minute laboratory sessions separated by at least 2 days. Randomly assigned pods contained a low pH (4.62; CaliPod) and a higher pH (5.52; JUUL) liquid; nicotine level was equivalent (39.4 mg/mL). We collected data on vaping topography, subjective effects, nicotine dependence, and plasma nicotine. **Results:** Mean plasma nicotine boost and mass of nicotine liquid consumed (20.90 ng/mL and 106.1 mg, respectively, for the low pH) were nearly twice as high when participants vaped the low pH liquid as compared to the higher pH liquid (p's <0.002). However, differences in total



volume puffed for the low and higher pH liquids (2.79 and 3.42 L, respectively) did not reach statistical significance. Average (31.4 mL/s) and peak (42.9 mL/s) puff flow rate were 1.2 times higher when participants vaped the low pH liquid ($p < 0.005$). Mean puff duration was shorter (2.80 vs. 3.82, $p < 0.0001$) when participants vaped the low pH. **Conclusion:** Participants took shorter, more aggressive puffs when vaping the lower pH nicotine salt pod. This resulted in almost twice the nicotine liquid consumption and nicotine uptake. These pilot results indicate that acidic pH values of nicotine salt liquids may be associated with the uptake and biological availability of nicotine from vaping. However, because these brands may differ in other aspects, human vaping studies of pod devices with liquids that differ only in pH must be conducted.

FUNDING: Federal; Academic Institution

POD25-3

THE EFFECTS OF INHALED FLAVORS ON INTRAVENOUSLY ADMINISTERED NICOTINE

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While all flavors except menthol have been banned from combustible tobacco cigarettes, e-cigarettes and other tobacco products are available in a wide variety of flavors. Despite this availability, there is limited research regarding the impact of different flavorants on the reinforcing properties of nicotine. The present study sought to examine the acute reinforcing effects of flavors inhaled from an e-cigarette, in combination with nicotine among smokers. Twenty-three menthol-preferring young adult (ages 18 to 30) smokers were randomly assigned to three different e-cigarette flavor conditions (menthol, green apple, or combination [menthol + green apple]) across three test sessions (a single flavor administered per session). During the test session, each participant received three intravenous deliveries of nicotine (saline, 0.25 mg, 0.5 mg/70 kg), which were administered one hour apart in random order. Menthol produced higher ratings of "cooling," when compared to green apple and the combination of green apple and menthol ($p < 0.05$). Green apple and the combined flavor produced greater craving for cigarettes than the menthol flavor ($p < 0.05$). As expected, intravenous nicotine dose-dependently increased the rating of "like drug effects," and reduced the urges to smoke cigarettes ($p < 0.05$). Nicotine also increased the rating of "dislike drug effects" ($p < 0.05$). These subjective effects of nicotine were not affected by menthol, green apple or combined flavors. The present findings did not support an interaction between nicotine and flavor for self-reported nicotine effects or urges to smoke cigarettes. The green apple flavor, alone or in combination with menthol, may contribute to maintenance of smoking by increasing craving.

FUNDING: Federal; Nonprofit grant funding entity

POD25-4

APPEAL, SUBJECTIVE EFFECTS, AND RELATIVE REINFORCING EFFECTS OF JUUL THAT VARY IN FLAVOR AND NICOTINE CONTENT

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Significance: The FDA may regulate ENDS characteristics, including flavor and nicotine content. These characteristics can affect product relative value and appeal. Methods for establishing differences in relative value that can be compared across products, studies, and individuals are lacking. We developed a novel concurrent choice task to evaluate relative reinforcement ENDS products. **Methods:** Young adult (age 18-25) JUUL users participated in one session during which they completed assessments of appeal/subjective effects (0-100 scale) and differential demand for JUUL of varying flavors (preferred vs. tobacco) or nicotine content (5% vs. 3%). Differential demand was assessed via a concurrent choice procedure wherein participants worked for fixed doses of JUUL vapor in exchange for expended effort. Effort required to obtain vapor of the preferred pod was on an escalating schedule, whereas effort for the non-preferred pod was fixed. **Results:** Fifteen participants completed the study (flavor sub-sample: $n=7$; nicotine sub-sample: $n=8$). Among flavor sub-sample participants, preferred flavor pods were rated more favorably than tobacco-flavored pods on appeal/subjective effects items (e.g., "Wanting more": 70.6 vs. 24.4; $p=0.002$); they also made greater choices for preferred vs. non-preferred pods during the choice task (7.9 vs. 3.6, $p=0.005$). Among participants in the nicotine sub-sample, no differences were observed between preferred and non-preferred nicotine content pods regarding appeal/subjective effects, including perceptions of how high pods were in nicotine (5% pods=52.3; 3% pods=41.4; $p=0.281$). Participants in the nicotine sub-sample made greater choices for non-preferred versus

preferred pods (3% pods=21.9 vs. 5% pods=4.9; $p=0.033$). **Conclusions:** Among young adult JUUL users, restricting JUUL to tobacco flavors may decrease the appeal/positive subjective effects of these products. Reducing JUUL nicotine content did not impact product appeal/subjective effects. Findings validate a novel methodology for assessing relative reinforcement of ENDS products with varying characteristics.

FUNDING: Federal

POD25-5

INFLUENCE OF TOBACCO AND E-CIGARETTE FLAVORS ON INTRAVENOUS NICOTINE SELF-ADMINISTRATION IN RATS.

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All flavor additives in tobacco and electronic nicotine delivery systems are conditioned reinforcers (CRs); the flavors become palatable based on pairings with primary palatable flavors (sweet/salt/umami) and calories and are subsequently used to increase the palatability of nicotine-containing products. Combining nicotine (NIC) with flavor CRs increases self-administration and motivation to obtain NIC and increases mesolimbic dopamine release evoked by NIC. We sought to extend previous findings to a common ENDS flavor (blueberry) and a high-throughput conditioning protocol (6 days of continuous access). Rats were randomly assigned to one of two flavor conditions (CR or Novel, $n=12$ /group) and one of two conditioning paradigms ($n=12$ /procedure): 6 days with sucrose and blueberry pairings (6D) vs. 24 days of pairings (24D). Rats in the CR groups received access to blueberry extract (0.25% v/v) in sucrose (20% w/v). The Novel group received access to 20% sucrose in tap water. Sucrose solutions were available for 144 h (24 days, 6 h per day or 6 days, 24 h per day). During IV NIC self-administration rats had access to two sipper tubes connected to lickometers to record contacts. For all rats, meeting the schedule of reinforcement on the active sipper tube resulted in IV NIC (0 or 7.5 ug/kg/infusion, $n=5-6$ /dose) and 0.1 ml aliquots of oral blueberry (0.25%, unsweetened) in the sipper tube. Meeting the schedule of reinforcement on the inactive sipper tube resulted in 0.1 ml aliquots of tap water. The 24D procedure produced a stronger CR than the 6D procedure, as evidenced by greater resistance to extinction during testing. Only rats in the 24D-CR group self-administered NIC; 7.5 ug/kg NIC increased responding relative to placebo. After the 6-day procedure no preference for the active sipper was observed in rats with access to 7.5 ug/kg/infusion. The 24D conditioning procedure may impart incentive salience to the flavor CR and promote interactions with NIC. Our findings indicate that salient and familiar characterizing flavors are important contributors to NIC self-administration may contribute substantially to ENDS use.

FUNDING: Federal

**PODIUM PRESENTATION 6****PAPER SESSION 28: NICOTINE REWARD:
ROLE OF NON-NICOTINIC PATHWAYS****POD28-1****TOBACCO FLAVORS ENHANCE NICOTINE REWARD BY
ALTERING VTA DOPAMINE NEURONS**

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Significance When comparing combustible and electronic cigarettes only one flavor is allowed with combustible cigarettes (menthol) while >7000 are available for electronic nicotine delivery systems (ENDS). With the growing number of users of ENDS there is an increased need to understand how flavor additives alter behavior related to reward and reinforcement. This is especially true given that there is a growing number of ENDS users preferring zero-nicotine flavored e-liquids. **Methods** We used conditioned place preference (CPP) and vapor self-administration assays with adult mice (3 - 5 months old, male and female) to study how flavors alter reward- and reinforcement-related behaviors. Whole-cell electrophysiology was used to examine how ventral tegmental area (VTA) dopamine neurons are altered in mice that completed behavioral tasks. To determine significance we use one- and two-way ANOVAs with Bonferroni post hoc analyses. **Results** Menthol and two green apple flavorants (farnesol and farnesene) enhanced nicotine reward-related behavior in a CPP assay. Alone, farnesene and farnesol both produced reward-related behavior in CPP assays with mice. In e-Vape self-administration assays, we observed that male mice failed to acquire self-administration behavior on a FR1 schedule with nicotine alone (6 mg/mL in 70:30 VGPG) but escalated with menthol + nicotine, green apple + nicotine, or green apple alone. Following escalation, mice were moved to a FR3 schedule and maintained stable responding. Here we observed that the highest number of FR3 responding was obtained by menthol + nicotine, green apple + nicotine, green apple alone, 6 mg/mL nicotine, and VGPG, in descending order. In electrophysiology assays, we observed an enhancement of VTA firing frequency in mice that were assigned the flavor + nicotine behavioral groups when compared to nicotine alone. Alone, green apple flavorants stimulated elevations of dopamine neuron firing frequency and facilitated enhanced excitability when stimulated by nicotine. Furthermore, farnesene was found to stimulate $\alpha 4\beta 2$ nAChR activation with an efficacy comparable to nicotine. In comparison, farnesol and menthol failed to stimulate nAChRs in a manner that matches farnesene's effect. **Conclusions** We observed that tobacco flavors cause direct changes in VTA dopamine neurons. Given the importance of these neurons in the reward pathway, further studies into other tobacco flavors are necessary to increase our understanding of how e-liquid flavors alter smoking-related behavior.

FUNDING: Federal; Academic Institution

POD28-2**ROLE OF MONOACYLGLYCEROLE LIPASE (MAGL) IN NICOTINE
DEPENDENCE: ANIMAL AND HUMAN STUDIES**

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Significance Chronic cigarette smoking is the leading cause of preventable death worldwide. Nicotine, the main psychoactive component in tobacco, plays a major role in the initiation and maintenance of tobacco dependence and addiction. A variety of nicotine cessation therapies have been developed; unfortunately, the efficacy of these treatments remains quite modest. Consequently, there remains an essential need for more effective pharmacotherapies than current existing treatments. Recent *in vivo* studies indicate that the endocannabinoid (EC) system modulates nicotine dependence. **Methods** The purpose of the present study was to investigate the role of monoacylglycerol lipase (MAGL), the primary catabolic enzyme of the endocannabinoid, 2-arachidonoylglycerol (2-AG), in both nicotine withdrawal and reward. We also assessed the association between genotypes and smoking withdrawal phenotypes in two human data sets. **Results** We tested the effects of the selective MAGL enzyme inhibitor, JZL184, on nicotine reward in mice using the conditioned place preference (CPP) test. Our data indicates that inhibition of MAGL by JZL184, dose-dependently and selectively reduces nicotine CPP. In addition, nicotine CPP was abolished in MAGL KO mice. However, the effect of JZL184 was not CB1 receptor mediated. The effects of MAGL enzyme

inhibition on nicotine withdrawal was evaluated in mice. Mice were implanted with 14-day osmotic minipumps. On Day 15, they were pretreated either with JZL184 (4, 8, and 40 mg/kg i.p.) or vehicle (i.p.) two hours before withdrawal. JZL184 was able to dose-dependently block somatic signs and anxiety-like behaviors and this effect was CB1 mediated. This decrease in nicotine withdrawal was replicated in the MAGL KO mice. Finally, repeated administration of JZL184 did not produce tolerance to the alleviation of withdrawal or alterations in CB1 receptor levels or receptor-mediated G-protein activity several brain regions. Lastly, genetic analyses in humans revealed associations of the MAGL gene with smoking withdrawal in humans. **Conclusions** Our data indicates that inhibition of MAGL may offer a promising target for treatment of nicotine dependence. *Acknowledgement: This research was supported by the National Institute on Drug Abuse P50DA-05274, R01DA032933 and DA014277.*

FUNDING: Federal

POD28-3**APPETITIVE CONDITIONING WITH THE STIMULUS EFFECTS
OF NICOTINE ENHANCES SUBSEQUENT NICOTINE SELF-
ADMINISTRATION IN RATS**

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Nicotine is the primary addictive constituent of tobacco products, and yet reliable nicotine administration in rats is difficult to obtain without prior food training and/or the inclusion of supporting sensory cues. In addition to reinforcing effects, nicotine also produces stimulus effects, which can form acquired associations with other reinforcing stimuli. Theoretically, such a learning history could add conditioned reinforcing effects to the nicotine stimulus, thereby increasing its overall reinforcement potency. The present experiment investigated whether such an associative learning history between the stimulus effects of intravenous (IV) nicotine and sucrose would enhance subsequent self-administration of nicotine in rats. Thirty-one Sprague-Dawley rats were implanted with indwelling jugular catheters and divided into four groups designating the type of conditioning they would experience between IV nicotine infusions and deliveries of 26% sucrose. Group assignments determined whether rats received infusions of either 0.03 mg/kg nicotine or saline, which were either Paired (30-sec delay) or Unpaired (300-sec delay) with 4-sec access to sucrose in daily 2-h sessions. Each rat experienced 10 conditioning trials each day for 24 sessions. The conditioning chambers were then fitted with nose-pokes and each rat was permitted to self-administer their assigned solution of nicotine or saline on a progressive ratio schedule of reinforcement for 14 sessions. Thereafter, nose-poking was placed on extinction for 10 sessions. Finally, all rats were tested for nicotine-primed reinstatement in a final extinction session. Nicotine self-administration was enhanced in the Paired-Nicotine group compared to the Unpaired-Nicotine, Paired-Saline, and Unpaired-Saline groups. However, reliable differences between groups were not observed in extinction and nicotine-primed reinstatement. These findings suggest that an appetitive conditioning history with the nicotine stimulus may strengthen the overall reinforcing effects of nicotine, which may then enhance the acquisition and maintenance of nicotine self-administration.

FUNDING: Federal

POD28-4**DIFFERENTIAL EFFECTS OF NICOTINE EXPECTANCY,
ADMINISTRATION, CRAVING, AND WITHDRAWAL ON RESTING
STATE FUNCTIONAL CONNECTIVITY BETWEEN THE INSULA
AND NUCLEUS ACCUMBENS**

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Background: Both the insula and nucleus accumbens (NAc) have been implicated in the development and maintenance of tobacco addiction, however relatively little attention has been directed toward understanding how changes in resting state functional connectivity (rsFC) between these regions are impacted by acute nicotine administration or by changes in subjective craving and withdrawal. **Aims:** To examine the impacts of perceived and actual nicotine administration and associated changes in craving and withdrawal on rsFC between the insula and the NAc. **Methods:** Twenty-six smokers were randomly assigned to receive either a nicotine inhaler (4mg deliverable) or a



nicotine-free inhaler across two sessions. Inhaler content instructions (told nicotine vs. told nicotine-free) differed across sessions. rsFC between sub-regions of the insula and the NAc were measured using magnetic resonance imaging before and after inhaler administration. **Results:** Actual nicotine administration contralaterally reduced rsFC between the AI and NAc, while reductions in rsFC between the mid-insula and right NAc were observed when nicotine was administered unexpectedly. Changes in rsFC associated with actual or perceived nicotine administration were unrelated to changes in subjective withdrawal and craving. However, changes in withdrawal and craving were independently associated with changes in rsFC. Specifically, change in withdrawal was found to be a significant covariate in analyses examining rsFC between the right AI and left NAc, as well as between the right mid-insula and right NAc, while change in craving was associated with rsFC between the left posterior insula and left NAc. Correlational analyses revealed that in each case relative decreases in withdrawal or craving were associated with relatively decreased rsFC after inhaler administration. **Conclusions:** The present findings suggest that insula and NAc may have separable modulating smoking-related motivational processes even in the absence direct nicotinic effects.

FUNDING: Federal; State; Academic Institution

POD28-5

ADULT NICOTINE SELF-ADMINISTRATION AND RELAPSE-RELATED BEHAVIORAL EFFECTS FOLLOWING ADOLESCENT EXPOSURE TO NICOTINE AND A CANNABINOID AGONIST

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Recent studies suggest that adolescent exposure to substances of abuse, including nicotine or cannabis, may alter neuromaturation and neurocognitive function during adulthood. Nicotine acts in the brain via neuronal nicotinic acetylcholine receptors. The main psychoactive component in cannabis, THC, acts on cannabinoid receptors. Here, we examine the effects of adolescent exposure to nicotine, a cannabinoid receptor agonist (WIN55-212,2), or co-exposure to both substances on nicotine self-administration and drug relapse-related behaviors in adult male and female mice. During adolescence (postnatal days 38-49), mice were injected with nicotine, WIN55-212,2, or both substances across 12 consecutive days. During adulthood, mice were trained in a food self-administration paradigm in operant boxes. Subsequently, catheters were intravenously implanted in the right jugular vein, and following a recovery period, the mice were given access to self-administer nicotine across a range of doses. Further, a separate cohort of mice were tested for incubation of craving to assess nicotine relapse-related behavior. Following acquisition of intravenous nicotine self-administration, mice were examined for lever pressing behavior in the absence of nicotine, on either day 1 or day 24 post-nicotine. Our findings reveal differential effects within each sex for both the nicotine self-administration and incubation of craving. Together, these data provide evidence that adolescent co-exposure to nicotine and cannabinoids alter later drug-seeking and nicotine relapse behaviors in a sex-dependent manner during adulthood. Supported by the Tobacco and Related Disease Research Program (TRDRP) award 26IP-0043 to CDF and the National Science Foundation Graduate Research Fellowship (NSF GRFP) award DGE-1839285 to AJE.

FUNDING: Federal; State

PAPER SESSION 29: DO BLUNTS IMPEDE TOBACCO PREVENTION?

POD29-1

#BACKWOODSGANG - EVIDENCE OF PEER CROWD TARGETING BY LITTLE CIGAR AND CIGARILLO BRANDS ON INSTAGRAM

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Significance: Social media provides new opportunities for the tobacco industry to tailor and target their marketing, especially towards young people. Understanding tobacco brands' online marketing approaches can inform prevention campaigns by revealing which populations are being targeted. To this end, we reviewed little cigar and cigarillo (LCC) social media marketing, with a particular focus on which peer crowds (subcultures with shared values and interests) were targeted and how brands promoted engagement. **Methods:** We randomly selected 4 posts per month per brand from the official Instagram accounts of 3 LCC brands (Swisher Sweets, Backwoods, Dutch Masters) from October 2018-July 2019 (n=120). Trained coders reviewed posts for characteristics including peer crowd targeting (Alternative, Country, Hip Hop, Mainstream, Popular), messaging themes, lifestyle content, people portrayed, use of influencers, and featured settings and activities. **Results:** Almost all posts targeted the Hip Hop peer crowd by portraying diverse young adults in urban settings, and incorporating elements of Hip Hop music and culture such as particular clothing styles and street art. Over half featured influencers (individuals with large Instagram followings), primarily rappers. In addition to direct product promotion, posts often portrayed social and aspirational lifestyles (e.g., partying, nightlife, rap concerts) as a means of establishing the product as an integral element of those desirable environments. Brands spurred engagement by asking users to "like" or "comment" on posts, and often promoted flavored products. **Conclusions:** Social media is an effective means for tobacco brands to build affinity and engage with targeted consumers. LCC marketing strongly targets the Hip Hop peer crowd by featuring key cultural indicators and associating LCC use with Hip Hop values and interests. These efforts work, as Hip Hop youth and young adults report disproportionately elevated rates of LCC use (Jordan et al., 2019; Lisha et al., 2016). Understanding LCC social media tactics is vital to inform the development of effective, targeted health campaigns to counter industry efforts.

FUNDING: Other

POD29-2

CHARACTERIZING BLUNT USE ON INSTAGRAM

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Significance: Blunts are partially or fully hollowed out cigar or cigarillo wrappers containing marijuana. Blunts are often consumed in social contexts. Instagram is a novel social context in which youth increasingly display blunt-related posts and is a potentially informative source of behavioral health information for investigating the increasing use of blunts. **Methods:** Trained coders conducted a content analysis of a random sample (N = 150) of Backwoods cigar-related posts on Instagram. Posts were coded in terms of characteristics (i.e., number of likes/views), characteristics of individuals in the post (i.e., perceived race/ethnicity), and blunt-related imagery/messages included in the photo/video (i.e., rolled cigars containing marijuana). **Results:** The 150 posts consisted of 80% photos and 20% videos. The average number of likes per photo was 107, and the average number of views per video was 250. Most (44%) of the individuals in the post were perceived as non-Hispanic White, followed by non-Hispanic Black (33%). Approximately 23% of the posts were blunt-related, 20% showed an individual smoking a blunt, and 3% showed an individual rolling a blunt. **Conclusion:** This investigation is one of the first to examine blunt use on Instagram. The results highlight the communication and promotion of blunt-related content. Future research is needed to examine social norms surrounding blunt use communicated via Instagram.

FUNDING: Federal

**POD29-3****RELATIVE EFFECTIVENESS OF PICTORIAL VS. TEXT-ONLY CIGARILLO WARNINGS AMONG YOUNG ADULTS**

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Significance: The FDA requires six text-only warnings for cigar products, including cigarillos. Research has demonstrated the superiority of pictorial over text-only cigarette warnings, yet no evidence exists on pictorial warnings for cigarillos. In a prior study, we used qualitative methods to pair images with each FDA text warning statement to develop cigarillo pictorial warnings. In the current study, we tested the relative effectiveness of these pictorial cigarillo warnings vs. text-only. **Methods:** Data were collected from a nationally-representative sample of young adult cigarillo users and susceptible nonusers ages 18-29. Participants were randomized to one of three experimental conditions: text-only or one of two pictorial conditions. We included two pictorial conditions to allow for the possibility that some images for a single text warning may be superior to others. Within each condition, participants viewed all six FDA cigarillo warnings. For each warning, we assessed participants' immediate reactions: perceived message effectiveness (PME), negative emotional reactions, and cognitive reactions (e.g., this warning helps me understand the risks). We conducted linear regression analyses to compare the overall effectiveness of text-only vs. pictorial cigarillo warnings. **Results:** Participants (n = 661) were 46.5% female, 68.9% White, and 21.9% Hispanic. Most were ever cigarillo users (80%); 20% were susceptible nonusers. In general, there were few differences between the two pictorial conditions. Pictorial warnings elicited higher PME and more negative emotional reactions than text-only warnings. For cognitive reactions, there were no statistically significant differences among the three conditions. **Conclusions:** This study provides the first data on pictorial warnings for cigarillos. We found that pictorial warnings were more effective than text-only warnings at inducing negative emotional reactions and increased PME, antecedents to behavior change. Our findings extend research on cigarette warnings to cigarillos, demonstrating that pictorial warnings are superior to text-only warnings for products beyond cigarettes.

FUNDING: Federal

POD29-4**ASSOCIATION BETWEEN ADOLESCENT BLUNT USE AND THE UPTAKE OF LITTLE CIGARS AND CIGARILLOS**

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Significance: Almost two-thirds of adolescents who smoke blunts also report using cigars, such as little cigars and cigarillos (LCCs). Although adolescent co-use of blunts and LCCs is prevalent, whether adolescent blunt use prospectively predicts LCC initiation and progression is unknown. We sought to determine whether adolescents who used blunts compared to those who did not, were more likely to initiate LCC use (use in the past 30 days) and to progress in the number of days used (in the past 30 days) across the subsequent 24 months. **Methods:** In this prospective cohort study of adolescents (N=1,825) from four public high schools outside of Philadelphia, PA, in-classroom surveys were administered at baseline (fall 2016, beginning of 9th grade) and at 6-month intervals for the following 24 months (fall 2018, beginning of 11th grade). We examined the association between self-report of blunt use within the past six months at baseline and initiation of LCC use (use in the past 30 days) and progression in the number of days used (in the past 30 days) across the subsequent 24 months. **Results:** A two-part Latent Growth Curve Model of LCC use revealed that past 6-month blunt use at baseline (vs. no past 6-month use) was associated with use of LCCs in the past 30 days at baseline (beta = 5.92, z = 9.29, p < 0.0001) as well as initiation of LCC use across the following 24 months (beta = .23, z = 2.15, p = 0.03). Blunt use was not associated with the number of days of LCC use at baseline or progression in the number of days of LCC use across follow-up (p values > .05). **Conclusion:** These findings highlight the risk that blunt use poses for early onset LCC use as well as initiation of past 30-day LCC use. Policies and public health campaigns addressing marijuana as well as LCCs will be important to reduce adolescent blunt use and cigar use.

FUNDING: Federal

PAPER SESSION 30: MATTERS OF MENTAL HEALTH IN TOBACCO CESSATION**POD30-1****MENTAL HEALTH MULTI-MORBIDITY IN THE EAGLES TRIAL AND ASSOCIATIONS WITH BASELINE FACTORS, NEUROPSYCHIATRIC ADVERSE EVENTS, AND SMOKING CESSATION**

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Significance: Although psychiatric (PD) and substance use disorders (SUD) are independent barriers to successful smoking cessation, little is known about how multiple diagnoses impact the safety and efficacy of smoking cessation treatments. The aims of this post-hoc analysis were to identify correlates of mental health co-morbidity (2 diagnoses) and multi-morbidity (3+ diagnoses) among smokers attempting to quit and to evaluate whether such conditions were associated with neuropsychiatric adverse effects (NAEs) or cessation efficacy (CE). **Methods:** Data for this analysis came from the EAGLES trial, which evaluated the safety and efficacy of varenicline, bupropion, and nicotine replacement therapy in smokers with and without psychiatric diagnoses. **Results:** Among participants who had a history of or current primary PD (n = 4103), 36.2% were diagnosed with multiple disorders (20.9% co-morbid, 15.3% multi-morbid). Descriptive summaries suggest that co- and multi-morbidity were associated with several baseline factors when compared to single diagnosis, including male gender, non-white race/ethnicity, more previous quit attempts, and more severe mental health symptoms. General linear models (GLMs) produced a main effect for number of PD/SUD diagnoses on moderate-to-severe NAEs (p < .0001). Regardless of treatment, multi-morbidity was more strongly associated with NAEs than both co-morbidity (risk difference = 6.8%) or single primary diagnosis (risk difference = 7.3%), p's < .0001. Additional GLMs produced non-significant main effects or interactions with treatment condition for number of diagnoses on two measures of CE. **Conclusion:** Although mental health multi-morbidity among smokers may be a risk factor for experiencing more moderate-to-severe NAEs during a quit attempt, it does not appear to influence CE of smoking pharmacotherapies. These findings reassure providers to advise smokers with PD and SUD that are in stable remission to consider using FDA-approved medications to make a quit attempt. They also encourage providers to be mindful of arranging mental health follow-up for smokers with psychiatric multi-morbidity who are trying to quit.

FUNDING: Pharmaceutical Industry

POD30-2**BASELINE DEPRESSIVE SYMPTOMS PREDICT DIFFERENTIAL TREATMENT RESPONSE TO VARENICLINE AND BUPROPION: SECONDARY ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL**

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Purpose: Smokers with concurrent depression are less likely to achieve abstinence, even with pharmacotherapy. However, the effect of sub-diagnostic depressive symptoms on smoking cessation is not well known. The purpose of this analysis was to evaluate if depressive symptoms at baseline differentially predict the effectiveness of bupropion and varenicline for smoking cessation in a randomized controlled trial (RCT). **Methods:** This is a secondary analysis of an internet-based RCT whereby participants enrolled online, received their medication in the mail and were followed up via email. Eligible participants were randomized 1:1 to receive a 12 week standard treatment of either bupropion (SR 150 mg) or varenicline (1mg). Self-reported depressive symptoms were measured at baseline, 4-, 8- and 12-weeks using the Patient Health Questionnaire 9 (PHQ9). **Results:** Participants who received medication (n=964) were grouped into those with no reported depressive symptoms at baseline (NS) (PHQ9 = 0; n=684) and those reporting depressive symptoms (DS)(PHQ9 > 0; n=280). Overall, the NS group had



significantly higher end of treatment quit than the DS group (22 % vs 14%; Chi^2 8.07; $p < 0.005$). However, when grouped by medication assignment, within the bupropion group, those with DS had significantly lower quit rates than those with NS (15% vs 7%; Chi^2 5.74; $p < 0.02$), while those assigned to varenicline did not differ in quit rates (DS quit 25% vs NS quit 27%; Chi^2 0.18; $p = 0.76$). Depressive symptoms at baseline was a significant predictor of quit in the bupropion group [OR=0.35 95%CI: 0.16-0.75 $p < 0.007$] but not in the varenicline group ($p < 0.08$). Conclusions: The presence of depressive symptoms at baseline was not a predictor of cessation among participants randomized to varenicline; however, in those randomized to bupropion, the baseline depressive symptoms predicted significantly lower odds of abstinence. These results are somewhat surprising given that bupropion is an anti-depressant. Additional analyses examining changes in depressive symptoms during treatment will also be presented.

FUNDING: Unfunded; State; Nonprofit grant funding entity

POD30-3

A RANDOMIZED CONTROLLED TRIAL OF INTEGRATED SMOKING CESSATION, EXERCISE AND WEIGHT MANAGEMENT COUNSELING IN PERSONS WITH SERIOUS MENTAL ILLNESS

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Significance Tobacco smoking persists at epidemic levels in persons with serious mental illness (SMI) and is the major cause of the premature mortality in this population. Most smoking cessation trials in SMI have enrolled only those interested in quitting within the next 30 days. We describe an ongoing NIMH-funded randomized clinical trial (RCT) for SMI smokers interested in quitting within 6 months. **Methods** The trial enrolls SMI smokers who report interest in quitting within 6 months and randomizes them to usual care or the 18-month TRIUMPH intervention. Intervention participants are offered evidence-based behavioral counseling for smoking cessation and weight management, smoking cessation pharmacotherapy, exercise recommendations and/or sessions, and text messaging support. The trial is being conducted in community mental health programs in Maryland. At baseline, we examined characteristics of participants who reported an interest in quitting within 30 days vs. those interested in quitting within 6 months but not 30 days. **Results** The 192 participants average 49.6 (± 11.7) yrs of age; 48% are African-American and 47% Caucasian; 70% are unemployed or receiving disability; 31% have less than a high school education. The most common psychiatric diagnoses are schizophrenia-spectrum (43%) and bipolar (32%) disorders. At baseline, participants had smoked for an average of 30.5 yrs. (± 13.2) and smoked 12.1 (± 9.4) cigarettes per day with mean expired air CO of 16.0 ± 11.1 ppm. Thirty-eight % reported an interest in quitting within 6 months but not 30 days. Those wanting to delay quitting were more nicotine dependent (Fagerstrom score 5.0 ± 2.0 vs. 4.2 ± 2.0 ; $p = .01$). The number of cigarettes per day, expired air CO, and smoking history did not differ significantly between groups. **Conclusions** In this ongoing RCT, over a third of SMI smokers express an interest in delaying quitting to between 30 days and 6 months; these smokers are more nicotine dependent than those ready to quit soon. We will describe elements of the TRIUMPH intervention including how to engage smokers with differing degrees of quit readiness in cessation treatment in order to promote quitting.

FUNDING: Federal

POD30-4

EFFECTIVENESS OF PROACTIVE TOBACCO OUTREACH IN SMOKERS WITH SERIOUS MENTAL ILLNESS

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Introduction: People with serious mental illness (SMI) have a high smoking prevalence and low quit rates. Few cessation treatments have been tested in smokers with SMI. Mental health (MH) providers are reluctant to address smoking. Proactive tobacco cessation treatments that reach out directly to smokers to offer counseling and medication may improve treatment utilization and quit rates. The current study is a secondary data analysis of a randomized controlled trial of proactive outreach for tobacco cessation treatment in VA MH patients. **Method:** Participants (N=1938, 83% male, mean age 55.7) across 4 recruitment sites, who were current smokers and had a MH visit in the past 12 months were identified using the electronic medical record. Participants were

randomized to Proactive outreach (a telephone outreach call plus invitation to engage in MH tailored telephone counseling and receive assistance obtaining nicotine replacement therapy [NRT]) or Control (usual care). The current study assessed outcomes in participants with SMI defined by a Kessler-6 score > 12 (a measure of psychological distress; N=982; 499 Proactive, 483 Control). Results: Among those with SMI, 72% of Proactive group participants were reached for an outreach call. Of those, 58% enrolled in telephone counseling. Compared to the Control group, participants in the Proactive group were more likely to engage in telephone counseling (22% vs 3%; OR=10.22, 95% CI 5.00,20.88), use NRT (51% vs 41%; OR=1.52, 95% CI=1.11,2.07) and use both counseling and NRT (19% vs 2%; OR=14.93, 95% CI=5.90,37.79). Participants in the Proactive group were also more likely to be abstinent (7-day point prevalence) at 12 months than the Control group (18% vs. 11%; OR=1.75, 95% CI=1.12,2.74). Conclusions: Proactive tobacco treatment is an effective treatment strategy for tobacco users with SMI. Proactive outreach had a particularly strong effect on counseling utilization. Future randomized clinical trials examining proactive tobacco treatment approaches in SMI treatment settings are needed.

FUNDING: Federal

POD30-5

ASSOCIATION BETWEEN CURRENT ESTABLISHED TOBACCO PRODUCT USE AND ATTENTION DEFICIT/HYPERACTIVITY DISORDERS (ADHD) AMONG US YOUTH FINDINGS FROM WAVE 3 (2015-2016) OF THE PATH STUDY

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INTRODUCTION: Past research demonstrates that youth with ADHD are at increased risk for cigarette use. However, little is known about ENDS use rates among youth with ADHD. The aim of this study is to compare the rates of cigarette use only, ENDS use only, and dual use of both cigarettes and ENDS among youth with and without an ADHD diagnosis in a nationally representative sample. **METHOD:** We used the Population Assessment of Tobacco and Health (PATH) Study Wave 3 data (2015-2016). For these analyses, the analytic sample consisted of 11,801 youth aged 12-17. Variables assessed included: ADHD diagnosis (based on parent report to the following question: has your child been told by a doctor, nurse or other health professional that {he/she} has ADHD?, coded as yes/no); current established (every day or some days) tobacco status (categorized based on adolescent's response to current cigarette use (yes/no) and current ENDS use (yes/no) and coded as: cigarette only user (n=128), ENDS only user (n=238), dual user (cigarette and ENDS) (n=83), or non-user (n=10,425). Chi square and binary logistic regression were used to assess the relationship between current established tobacco user status and ADHD diagnosis. **RESULTS:** Overall, 1.2% used cigarettes only, 2.3% used ENDS only, and 0.8% were dual users. 10.1% (n=1,129) of parents reported their child had an ADHD diagnosis. Among youth with an ADHD diagnosis, the percentage of current established cigarette only use, ENDS only use, and dual use were 1.7%, 3.4%, and 1.9%, respectively; the same percentages were 1.2%, 2.2%, and 0.6% among the adolescents without ADHD ($p < 0.001$). Compared to non-users, the odds ratio (OR) of having ADHD was 1.83 (95% CI: 0.99-3.34) for cigarette only users, 1.69 (95% CI: 1.05-2.71) for ENDS only users and 3.9 (95% CI: 1.92-7.93) for dual users after adjustment for age, sex, and race. **CONCLUSION:** Dual use and ENDS only use were significantly associated with parent report of an ADHD diagnosis. It is critical for health care providers to be screening youth for ENDS use, especially youth who are diagnosed with ADHD.

FUNDING: Federal

**PAPER SESSION 31: ANALYTIC AND
METHODOLOGICAL ADVANCES TO
IMPROVE THE QUALITY OF CESSATION
RESEARCH****POD31-1****IMPROVING A DEEP LEARNING MODEL TO PREDICT SMOKING
RISK FROM IMAGES OF PERSONAL ENVIRONMENTS**

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Background and Significance Smokers report increased craving and tobacco use when viewing environments where they habitually smoke compared to environments where they do not, suggesting that these environments may contribute to lapses and relapse following a quit attempt. Our previous research has demonstrated that smoking environments can be recognized with a deep learning approach, in which objects and settings in images of daily life are identified and used as individual predictors of smoking risk. This result suggests that images of daily environments can be used to support just-in-time adaptive interventions (JITAs), or to identify specific environmental cues that may confer risk for smoking and potentially other target behaviors. **Methods** In the current project, we further explore and improve upon these results by introducing several modifications to our deep learning methodology and training our model on an expanded cohort of over 300 smokers from the Durham, NC and Pittsburgh, PA areas. Critically, our updated model is optimized for mobile devices, making it suitable for implementation as part of a digital health intervention. Additional methodological improvements include (a) expansion of the range of environmental objects and settings our model can identify, (b) a more flexible deep learning architecture that evaluates the number of objects per image and their importance to the image as a whole, and (c) a hierarchical, nonlinear approach to scene understanding and smoking risk prediction. **Results** These improvements resulted in strong performance in identifying smoking versus nonsmoking environments (AUC 0.846; accuracy 0.787) similar to previous work while achieving a 10-fold reduction in model complexity (i.e., number of model parameters) and providing new information about the composition of daily environments in which participants smoke. **Conclusion** This work demonstrates an improved approach to assessing environment-based risk, and represents an important step toward implementation of a JITA that incorporates information about daily environments. Future work will focus on pilot testing of a digital health intervention for smoking cessation based on this model.

FUNDING: Federal

POD31-2**COMPARISON OF CIGARETTES PER DAY ASSESSED VIA THE
PERSONAL AUTOMATIC CIGARETTE TRACKER (PACT) AND
SELF-REPORT**

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Significance. Current approaches for assessing tobacco cigarette use in the natural environment are limited. Self-reported cigarettes per day (CPD) may be subject to memory biases and under- or over-reporting, resulting in inaccurate estimates of smoke exposure. Portable devices designed to capture puff topography also have limitations, as using these devices may alter normal smoking behavior. There is a strong need for an assessment system that can reliably and objectively track cigarette use and exposure in the natural environment while addressing the limitations of self-reported CPD and currently available portable puff topography devices. To address this need, the current research used the previously validated Personal Automatic Cigarette Tracker (PACT). PACT, a non-invasive wearable system, yields an estimate of smoke exposure, does not interfere with smoking behavior, and can reliably capture natural smoking behavior. PACT also includes a modified lighter that captures lighting events. The primary goal of this study was to assess how self-reported CPD corresponded to cigarettes detected by a portable puff topography device (Clinical Research Support System; CReSS) and PACT. **Methods.** Forty-four tobacco cigarette smokers participated in 5 consecutive days of assessment in which they completed a variety of self-report use measures, utilized a

CReSS device on two randomized days, and smoked normally while wearing the PACT system each day within their natural environment. Key variables included self-reported CPD, CReSS-detected cigarettes, PACT-detected cigarettes, and lighter-detected cigarettes. **Results.** Overall, self-reported CPD were significantly higher relative to CPD detected via the devices (CReSS, $p < .001$; PACT, $p = .001$). Cigarettes detected by the lighter did not significantly differ from self-reported CPD ($p = 1.0$). **Conclusions.** The data demonstrate that participants tended to report more cigarettes than detected by either PACT or CReSS, which is in line with literature suggesting self-reported CPD is susceptible to over-reporting. These data provide further support for the utility of the PACT system for noninvasive monitoring of cigarette smoking.

FUNDING: Federal

POD31-3**LACK OF UTILITY OF CIGARETTES PER DAY CUTOFFS FOR
CLINICAL AND LABORATORY SMOKING RESEARCH**

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Significance: The selection of inclusion criteria for smoking research studies has important scientific and ethical implications. The vast majority of clinical and laboratory smoking research studies require participants smoke above a certain rate to be eligible to participate, typically with the goal of restricting the sample to smokers with a tobacco use disorder, those who experience nicotine withdrawal, or those who are likely to struggle with cessation. The aim of the present project was to determine whether smoking rate is indeed an effective screening tool for identifying these groups of smokers and to determine the optimal cutoffs when doing so. **Methods:** Using data from daily smokers in the National Epidemiologic Study of Alcohol Use and Related Conditions - III (NESARC-III), we used receiver operating characteristic (ROC) curves to examine the relationship between smoking rate and: (1) DSM-5 criteria for tobacco use disorder; (2) nicotine withdrawal; and (3) history of failed quit attempts. Exploratory analyses sought to determine if these relationships differed as a function of gender, race, ethnicity, socioeconomic status or the use of multiple tobacco products. **Results:** The relationship between smoking rate and the presence of tobacco use disorder (AUC = .664), experience of nicotine withdrawal (AUC = .672) and history of failed quit attempts (AUC = .578) was universally weak. The relationship between smoking rate and a history of failed quit attempts was weaker for women than men ($p < .05$), but otherwise relationships did not differ as a function of gender, race, ethnicity, socioeconomic status or multiple tobacco product use. Optimal cutoffs based on sensitivity/specificity ranged from ≥ 9 CPD to ≥ 15 CPD, but the largest number of correct classifications occurred at very low smoking rates (≥ 2 -3 CPD). **Conclusions:** Smoking rate is a poor proxy for tobacco use disorder, nicotine withdrawal and difficulty quitting. Researchers should strongly consider abandoning the use of smoking rate cutoffs. When using cutoffs, a rationale should be provided, along with justification for the specific cutoff used.

FUNDING: Federal

POD31-4**UTILIZING SUPPLEMENTAL DATA FOR MORE PRECISE
ESTIMATION OF THE EFFECT OF VERY LOW NICOTINE
CONTENT CIGARETTES IN SMOKERS WITH SERIOUS MENTAL
ILLNESS**

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Background: Evaluating a nicotine standard for cigarettes requires a precise estimate of the effect of very low nicotine content (VLNC) cigarettes in all smokers, including vulnerable subpopulations. Randomized clinical trials (RCTs) that target the general adult smoking population often lack adequate power to evaluate the effect of VLNC cigarettes in subgroups, whereas RCTs targeting vulnerable subpopulations are often small. Augmenting small trials with data from other trials can increase precision, but can also result in bias. A new class of Bayesian models provides a powerful tool for utilizing supplemental data to increase efficiency, while limiting bias. **Methods:** We analyzed data from four RCTs. The primary study was a 6-week trial that randomized 58 smokers with schizophrenia or bipolar disorder to either VLNC (0.4 mg/g SPECTRUM) or control (15.8 mg/g SPECTRUM) cigarettes. Supplemental data were available from three other



trials that randomized smokers to VLNC or control research cigarettes. The primary endpoint was total cigarettes smoked per day (CPD). Data were analyzed by ANCOVA adjusting for baseline CPD using the primary study data, alone, as well as using multi-source exchangeability models (MEMs), a novel Bayesian approach for incorporating supplemental data into the analysis of RCTs. **Results:** The analysis using only data from the primary study found that smokers randomized to VLNC cigarettes smoked 4.0 fewer CPD at week 6 than smokers randomized to the control condition (95% CI: -0.2, 8.3). Using MEMs, the treatment effect was 5.5 (95% CI: 4.4, 6.6), corresponding to a 75% reduction in the width of the 95% confidence interval. The amount of borrowing can be further calibrated using the effective supplemental sample size, which quantifies the amount of supplemental data used in the analysis. **Discussion:** Estimating the effect of VLNC cigarettes in vulnerable sub-populations is an important step to fully understanding the impact of a nicotine standard for cigarettes. Recent advancements in Bayesian statistics provide powerful tools for studying vulnerable sub-populations through the incorporation of supplemental data.

FUNDING: Federal

PAPER SESSION 32: TRANSDISCIPLINARY ASSESSMENT OF CARDIOPULMONARY RISK OF ANDS AND TOBACCO SMOKE

POD32-1

MODULATION OF PRIMING OF CIRCULATING NEUTROPHILS BY CIGARETTE SMOKE AND ALTERNATIVE NICOTINE DELIVERY SYSTEMS IN VIVO

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Significance. In the blood, circulating neutrophils, along with other leukocytes, are the main producers of reactive oxygen species (ROS). The pathogenesis of diseases such as COPD, gout, and a number of others is directly related to the activation of ROS generation systems in neutrophils. It is known that smoking has an immunosuppressive effect concomitant with enhancing the pro-inflammatory response from phagocytic cells. The market of alternative nicotine delivery systems is oversaturated with products of scanty known (especially in the long run) safety and biological effects. In this regard, the task of rapid assessment of the health risks derived from new nicotine products is particularly timely. **Methods.** Recently, we have developed and presented a chemiluminescence model for assessing the activity of neutrophils in the composition of whole blood, which reflects the state of ROS generation systems stimulated by various components of cigarette smoke. In this work, we used the same chemiluminescence approach to test new types of nicotine-containing and nicotine-free products on smoking volunteers and to establish the nature of changes in the activity of ROS generation systems in circulating neutrophils upon stimulation by various agents (non-ozonized zymosan, calcium salts, microparticles of tobacco dust, etc.). **Results.** We have established that, according to some indicators of ROS generation, e-cigarette aerosols exhibit effects similar in scale and dynamics to the effects of cigarette smoke. Based on this risk-assessment criterion, such products as snus and its analogues have a noticeable advantage over e-cigarettes. As our studies have shown, the least modulation of blood phagocytes is exerted by the use of so-called white snus, including tobacco-free snus. However, the latter products are not lacking drawbacks, causing irritation of the mucosa in the oral cavity. **Conclusion.** Modulation of the priming of circulating neutrophils furnishes an appropriate biomarker for the assessment of potential biological effects of nicotine and nicotine-free smoking/vaping products.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD32-2

ASSOCIATION BETWEEN VAPING AND HYPERTENSION AMONG US ADULT ELECTRONIC CIGARETTE (E-CIGARETTE) USERS - RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVE 3

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SIGNIFICANCE: Hypertension and smoking are the top two leading risk factors contributing to preventable mortality. Tobacco smoking has an acute effect of increasing blood pressure and is associated with masked, renovascular and malignant hypertension. Although the prevalence of cigarette smoking has declined in the US, use of E-cigarettes (vaping) has increased exponentially in recent years with some using these as an alternative to total cessation. Recent trials have demonstrated that vaping can acutely elevate blood pressure. However, the association of vaping with hypertension is still inconclusive. The objective of this investigation was to examine the association of vaping with hypertension in adults from the Population Assessment of Tobacco and Health (PATH) Study. **METHODS:** Data for 28,148 adults from the PATH Study wave 3, collected from October 2015 to October 2016, were analyzed. Weighted multivariable logistic regression models were used to compare differences in hypertension prevalence between E-cigarette users (vapers) and non-vapers in different age groups. Smoking status, sex, ethnicity, race, marital status, education, income, insurance type, body mass index, physical activity, hypercholesterolemia and diabetes mellitus were adjusted. We further investigated the association of smoking and vaping with hypertension by examining risk differences among non-users, exclusive vapers, exclusive smokers, and dual users. **RESULTS:** A total of 1,154 adults (2.63%) were established current vapers. The overall weighted prevalence of hypertension was 31.84% (6,863 adults).



After adjusting for smoking status and other covariates, compared with non-vapers, the risk of hypertension was significantly higher among vapers aged 35-54 years (adjusted odds ratio [aOR] = 1.42; 95% CI 1.02-1.98), and significantly lower among vapers ages 55+ (aOR = 0.67; 95% CI 0.51-0.90). No significant difference in hypertension was found between vapers and non-vapers aged 18-34 years. As compared with non-users, the adjusted odds ratio for hypertension risk among dual users was 1.21 (95%CI 0.60-2.44) in 18-34 years olds, 1.56 (95%CI 1.08-2.26) in 35-54 year olds, and 0.53 (95%CI 0.35-0.80) in those 55+ years old. **CONCLUSION:** Among people aged from 35 to 54 years old, vaping was associated with increased risk of hypertension. Dual use did not reduce the risk of hypertension in those under age 55.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD32-3

SMOKING BUT NOT VAPING IS ASSOCIATED WITH HYPERTENSION AMONG ADULTS: RESULTS FROM WAVE 3 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY.

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Significance: As use of e-cigarettes (vaping) continues to grow among U.S. adults, the assessment of their potential health effects is essential. While a rapid increase in systolic blood pressure after a single session of vaping has been reported in literature, no studies to date have looked at the potential link between vaping and sustained hypertension (HTN). Using nationally-representative data, we evaluated the association of smoking and vaping with self-reported HTN. **Methods:** Cross-sectional analyses were conducted using data from Wave 3 (2015-2016) of the PATH Study. Wave 3 included 28,148 adult participants, of which 25,524 had exposure and outcome information. Multivariate logistic regression estimated the odds of self-reported HTN across nicotine product categories, controlling for participants' demographics, lifestyle, and medical history. Primary models utilized a joint product use classification based on patterns of product use (never user, former smoker, current vaper who never smoked regularly, current vaper who used to smoke regularly, current smoker, dual user), while secondary analysis considered each product separately (never vs. former vs. current smoker/vaper). **Results:** In a primary analysis, former smokers [aOR= 1.19 (1.03-1.36)], current smokers [aOR=1.29 (1.14-1.47)], and dual users [aOR= 1.29 (1.05-1.58)] had higher odds of self-reported HTN versus never users. No significant differences were observed between never users and current vapers who never smoked regularly. In secondary analysis (vaping and smoking modeled as separate risk factors), smoking in the past and current smoking were associated with higher odds of HTN than never smoking; former vaping and current regular vaping were not associated with higher odds of HTN compared to vapers who used e-cigarettes occasionally. **Conclusions:** Smoking has been found to be associated with higher prevalence of hypertension, whereas no association was found with vaping. While e-cigarettes have been adversely associated with acute cardiovascular events, use of these products does not appear to be associated with sustained elevation in blood pressure.

FUNDING: Federal; Academic Institution

POD32-4

THE EFFECT OF TOBACCO SMOKE EXPOSURE ON PULMONARY FUNCTION RESULTS IN U.S. NONSMOKING ADOLESCENTS

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Significance: Tobacco smoke exposure (TSE) adversely affects respiratory health. However, the effects of exposure on non-asthmatic adolescents are not well known. The study objective was to examine the effect TSE has on pulmonary function results among U.S. nonsmoking adolescents. **Methods:** We analyzed 2007-2012 National Health and Nutrition Examination Survey data including 2,994 nonsmoking adolescents without current asthma. TSE measures included serum cotinine and self-reported exposure to tobacco smoke inside the home. Outcome measures included spirometry test results measured as forced expiratory volume in one second (FEV1) which determines airway obstruction, restriction, or muscle strength weakness, and the ratio of FEV1 to the forced vital capacity (FVC) which determines overall airway obstruction. We built logistic regression models to assess the associations between TSE and pulmonary function test results, while adjusting for adolescent age, sex, race/ethnicity, and income level. **Results:** A total of 34.5% nonsmoking adolescents had low cotinine levels (0.05-2.99ng/

mL) indicative of passive TSE and 6.5% had high cotinine levels (≥ 3.00 ng/mL) indicative of active smoking. Concerning self-report TSE, 11.8% were exposed to tobacco smoke in their homes. Adolescents with high TSE were 1.51 times more likely (95% confidence interval [CI]=1.24-1.85) to have a FEV1% ≤ 0.80 than unexposed adolescents (cotinine < 0.05 ng/mL), while controlling for the sociodemographic covariates. Adolescents with low TSE were 1.13 times more likely (95%CI=1.03-1.25) and adolescents with high TSE were 1.76 times more likely (95%CI=1.50-2.06) to have a FEV1/FVC ratio ≤ 0.80 than unexposed adolescents. Adolescents with home TSE were 1.43 times more likely to have a FEV1% ≤ 0.80 (95%CI=1.26-1.63) than adolescents with no home TSE. No differences were found between home TSE and FEV1/FVC ratio. **Conclusion:** We report that passive and active TSE are associated with lower pulmonary function, independent of sociodemographics. The decreased pulmonary function test results observed in this population of non-asthmatic adolescents exposed to tobacco smoke is concerning as these effects may persist into adulthood and cause respiratory morbidity throughout the lifetime of nonsmoking populations.

FUNDING: Federal



PAPER SESSION 33: SURVEILLING INDUSTRY BEHAVIOR

POD33-1

THE FOX GUARDING THE HENHOUSE - THE TOBACCO INDUSTRY, ILLICIT TRADE, AND CODENTIFY

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Significance The threat of illicit trade is an industry argument against almost any tobacco control policy. In some countries illicit trade is an actual issue. It is often correlated with high levels of corruption, poor control of the supply chain, and lack of enforcement. One tool to help eliminate illicit trade is a reliable track and trace system. Codentify is a Philip Morris International (PMI) created identification system which involves a marking on a pack that they say reduces counterfeiting and can verify the tax status. In Mexico, part of the 2014 Special Tax on Production and Services Bill (IEPS) required tobacco products to have a security code. With the absence of an independent track and trace system, the tobacco industry used this requirement to offer Codentify. We describe the extent of Codentify on packs in Mexico City. **Methods** In August 2017, we purchased unique cigarette packs in twelve neighborhoods in Mexico City using a systematic protocol. Two coders reviewed packs to identify the presence of a Codentify marking. Other information including manufacturer, brand, and price was also collected. **Results** 98 unique cigarette packs were collected in Mexico City: 47 from PMI, 37 from British American Tobacco (BAT), and 14 from Japan Tobacco International (JTI). 43 packs (44%) featured a Codentify marking: 41 out of the 47 PMI packs (87%), 2 out of 14 JTI packs (14%) and none on BAT packs. Packs with Codentify (M\$40.5) appear to be priced similarly to packs without Codentify (M\$41.2). **Conclusion** Codentify marked packs do appear to be prominent in Mexico City in 2017. Despite the PMI created system being freely licensed by both BAT and JTI, the presence of Codentify markings was primarily found (95%) on PMI packs. Codentify is advertised as a system that can be used by all companies, but in practice there appears to be minimal or no uptake by major companies other than PMI. Many questions remain unanswered around Codentify: it is unclear why Codentify was not used on all PMI packs, nor why JTI used Codentify but not BAT.

FUNDING: Nonprofit grant funding entity

POD33-2

WE'VE SEEN THIS BEFORE, JUUL'S (BIG TOBACCO'S) PLAYBOOK

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Few industries provoke the level of mistrust, skepticism, and criticism as Big Tobacco. As the public began to suspect that smoking was not a harmless pastime, the industry developed strategies to manipulate the narrative by sowing doubt and undermining scientific research. These strategies became evident as whistleblowers have come forward and litigation has played out; making it clear that Big Tobacco has a "Playbook" it uses to maintain profits, skirt regulation, and deceive the public. While common knowledge of Big Tobacco's Playbook has likely detrimentally impacted public perception of cigarettes, new commercial tobacco products have emerged, specifically marketing themselves as entirely unlike Big Tobacco's products. One such product, Juul, has attempted to garner social goodwill by suggesting it is the antithesis to Big Tobacco's deadly cigarettes. However, lurking beneath the surface, it is clear that Juul has specifically adopted marketing, public relations, scientific research, and political involvement strategies that directly mirror Big Tobacco's Playbook. And adopting those strategies has allowed Juul to capture the ENDS market and become a significant driver of the youth e-cigarette epidemic. This session will provide background on classic Big Tobacco strategies and narratives and will examine the parallels to Juul's behavior as the company secures its spot as an industry giant. This session will also discuss what to watch for from Juul as it faces increased regulation given the knowledge of Big Tobacco's past efforts to undermine effective regulation. Finally, this session will present policy suggestions as the FDA contemplates how to regulate Juul in the face of the youth nicotine epidemic and how to use our established knowledge of Big Tobacco's Playbook to inform its policy-making.

FUNDING: Nonprofit grant funding entity

POD33-3

SMOKERS' ATTITUDES TOWARD TOBACCO CONTROL LAWS AND TOBACCO INDUSTRY INTERFERENCE IN LAWMAKING AFTER EXPOSURE TO COURT-ORDERED CORRECTIVE STATEMENTS

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Significance: Internal tobacco industry documents indicate that when opposing proposed tobacco control laws, tobacco companies prefer lawmakers to perceive them as representing smokers' views. After violating federal racketeering laws, tobacco companies began publishing court-ordered corrective statements (CS) as newspaper and television ads in November 2017. Periodic publication of the CS as cigarette pack inserts began in November 2018 and will continue through mid-2020. This is the first study to examine smokers' attitudes toward current or proposed tobacco control laws or tobacco company interference (TII) in lawmaking after exposure to the CS and related court findings (CF). **Methods:** A cross-sectional survey conducted in May 2017 using GfK's web-enabled KnowledgePanel®, polled U.S. adult smokers (n=265) and U.S. adult non-smokers (n=1,145) on their attitudes toward 12 current or proposed tobacco control laws and 7 examples of TII in lawmaking after reading the CS and CF. Multiple linear regression was used to compare responses between smokers and non-smokers. Survey weights produced by GfK compensated for unequal probabilities of selection based on gender, age, race/ethnicity, education, census region, household income, home ownership status, and metropolitan/non-metropolitan area. **Results:** There were significant differences between smokers and non-smokers for 10 of the 12 laws surveyed. No differences between the two groups were observed for laws to "reduce nicotine in cigarettes to a level that is not addictive" (77.5% smokers; 75.8% non-smokers) or to "fund programs to help prevent youth from smoking and to help smokers quit" (82.3% smokers; 82.0% non-smokers). Most smokers favored 7 of the 12 laws surveyed, as compared to all 12 laws among non-smokers. There were also significant differences between smokers and non-smokers for all 7 examples of TII in lawmaking. However, most smokers disapproved of 6 of the 7 examples, as compared to all 7 examples among non-smokers. Most respondents thought lawmakers should not "trust tobacco companies to provide accurate information on tobacco issues (52.6% smokers; 67.5% non-smokers) and that lawmakers should not "allow tobacco companies or tobacco company lobbyists to help write laws" (58.9% smokers; 70.6% non-smokers). **Conclusions:** These results could inform local, state, and national policy initiatives by helping public health advocates counter misperceptions among lawmakers that most smokers oppose all tobacco control laws or support tobacco industry interference in lawmaking.

FUNDING: State; Academic Institution

POD33-4

A CONTENT ANALYSIS OF TOBACCO PRODUCT MISINFORMATION IN THE MEDIA ENVIRONMENT

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Significance: The threat of tobacco-related misinformation in the media environment has historically been a public health concern, especially due to the marketing efforts of the tobacco industry. In 2006 after big tobacco companies were found to have deliberately misled the public by the U.S. District Court, severe limitations on their ability to advertise were put in place. In the current media environment, however, new concerns for tobacco misinformation dissemination arise due to the unmediated nature of new media platforms. **Methods:** In this content analysis, researchers sought to quantify the level of tobacco-related misinformation in the media environment. Machine learning techniques were utilized to establish a census database of tobacco-related media content ranging from May 18th, 2014 to December 31st, 2017. Broadly, the data fell into two categories; long-form texts (Associated Press, major newspapers, broadcast TV and radio news transcripts, and popular websites among youth) and social media (Twitter and YouTube) posts. In this study we focused on the corpora of long-form texts (N=141,195) and Tweets (N=58,460,000). A weighted sample of long-form texts (n=1475) and Tweets (n=1068) were then hand-coded by six coders for the presence of claims about tobacco-related health consequences, use patterns, policies, and tobacco industry actions. Texts containing claims were analyzed for the presence of misinformation. Misinformation was determined based on facts that are "considered to be correct or incorrect by expert consensus" at the given time of this study. **Results:** 49% of the long form texts contained claims, and of these, 4% were coded as misinformation. Claims were rarer on Twitter (10%, of all tweets) but they were more likely (18%) than long form texts to be ($\chi^2(1), 5.1745, p=.023$) to be misinformation. These false claims



mostly consisted of unfounded health consequences of tobacco product use as well as non-scientific methods for cessation. **Conclusion:** Misinformation was uncommon on long form media (2% of all texts), and even on Twitter (2% of all tweets.) Although when claims were made on Twitter, they were more often false. On Twitter, users are able to freely post and share tobacco product related information, including that which might be false, or endorsements of "false facts". Although such posts might be innocuous at the singular level, aggregate exposure to these messages can contribute to the development of favorable beliefs towards tobacco products, and ultimately their use.

FUNDING: Federal

POD33-5

TRANSITIONING FROM COMBUSTIBLE CIGARETTES TO ALTERNATIVE TOBACCO PRODUCTS, AN ANALYSIS OF INDUSTRY DOCUMENTS

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Significance: Regulation of combustible cigarettes has increased over time, leading to decreased consumption and reduced profits for tobacco manufacturers. Since at least the 1960s the tobacco industry has prepared to transition into alternative nicotine and tobacco products. The 21st century development of e-cigarettes has accelerated this transition. **Methods:** We reviewed tobacco industry documents between 2000 and 2018 to assess how tobacco manufacturers strategized to enter the alternative product market, and determine their anticipated product mix. **Results:** Between 2001 and 2010 tobacco manufacturers developed long-term product transition plans that relied on a "healthy product stream from [the] cigarette business" to invest in "new tobacco product categories," including dissolvables, snus, and e-cigarettes. In internal corporate strategy documents, executives stated that this transition was appealing due to limited regulation on new products, particularly in the US. New products are not covered by the Master Settlement Agreement and are typically taxed at lower rates than combustible cigarettes, resulting in "higher profit margin." **Conclusions:** Manufacturers of combustible cigarettes view alternative tobacco and nicotine products as extensions of the combustible cigarette market. They plan to develop and market these products the same way that they have combustible cigarettes, by explicitly marketing to people who have never used tobacco products. The current policy landscape, which regulates alternative tobacco and nicotine products more loosely than combustible cigarettes, has made this industry transition appealing.

FUNDING: Federal

PAPER SESSION 34: DEPENDENCE, DEMAND, AND CIGARETTE USE IN YOUTH AND ADULT VAPERS

POD34-1

NICOTINE DEPENDENCE AND DEMAND AMONG POD-MOD ELECTRONIC CIGARETTE USERS AS A FUNCTION OF SMOKING STATUS

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Significance: Electronic cigarette (e-cigarette) use continues to proliferate with fast-paced product evolution. Pod mod e-cigarettes emerged on the market in 2015 and have changed the tobacco landscape again. While existing research has investigated nicotine dependence among users of earlier generation e-cigarettes as a function of cigarette use status, these studies are not reflective of users of the most current and prominent products on the market. The current study describes e-cigarette dependence and demand among pod-mod users as a function of smoking status (current smokers/dual users, former smokers, and never smokers). **Methods:** Participants were 593 young adult ($M_{age} = 25.9$ years) JUUL users recruited via Amazon's Mechanical Turk. Respondents were specifically recruited based on current use of pod-mods (but may also be using other e-cigarette devices) and smoking status (never, former, and current/dual users). Participants completed online measures assessing e-cigarette use patterns, dependence, and demand (hypothetical willingness to pay for e-cigarette use and use in a single day if e-cigarettes were free). **Results:** Dual users of pod-mods and cigarettes displayed greater e-cigarette dependence compared to current pod-mod users with no history of cigarette smoking ($p = .033$). Similarly, dual users showed the greatest levels of e-cigarette demand compared to both former smokers and those without a history of smoking ($ps < .05$). **Conclusions:** Dual users displayed the greatest e-cigarette dependence and demand across groups which may suggest that dual users are exposed to higher levels of nicotine via greater use or more efficient nicotine extraction and delivery, leading to greater dependence. Alternatively, smokers who are prone to dependence may have more difficulty switching completely from cigarettes to e-cigarettes, making it more likely that individuals who are highly dependent will be dual users than former smokers. Future research should directly assess these and other potential mechanisms for this effect and continue to monitor e-cigarette dependence as the tobacco landscape changes with the emergence of new e-cigarette products and innovations.

FUNDING: State

POD34-2

PATTERNS AND PREDICTORS OF EXCLUSIVE, DUAL, AND CONCURRENT USE OF E-CIGARETTES AND TOBACCO AMONG ADOLESCENTS

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Adolescent e-cig use increases risk of tobacco cigarette use and frequency of use. Dual use of tobacco products is associated with greater risk of addiction. Additionally, an environment favorable to e-cig use may cultivate a re-normalization of tobacco use. As such, we examined adolescent exclusive and dual use patterns and individual and environmental predictors of use among 50 vapers (ages 14-17) in Kentucky. An initial survey assessed demographics and e-cig and tobacco use and perceptions. Daily surveys over two weeks (700 observations) obtained real-time data on adolescents' e-cig and tobacco use and intentions, and environmental context of e-cig use. Adolescents reported non-use on 38% of days, exclusive vaping on 44%, exclusive smoking on 8%, dual-use (vaping and smoking within 24 hours) on 9%, and concurrent use (any tobacco product use within two hours of vaping) on 12%. On average, adolescents vaped 7 times per day, took 55 total puffs per day, and smoked 2 cigarettes per day. We used mixed effects random intercept regressions and random intercept generalized linear models to determine use patterns and between and within predictors of use. The linear trend (one-week period, repeated twice) significantly predicted vaping occasions per day, total e-cig puffs per day, and concurrent daily use, indicating greater use on the weekend. Vaping-only days were predicted by same day exposure to peers vaping, higher prior day vaping intentions, and lower prior day tobacco smoking intentions. Tobacco-use-only days were predicted by no exposure to peers vaping on the same day.



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Dual-use days were predicted by lower negative e-cig expectancies, parental norms favorable to e-cigs, same day exposure to adults vaping, peers vaping, and exposure to e-cig advertising, and higher prior day tobacco intentions. Concurrent-use days were predicted by younger age of e-cig initiation, higher positive e-cig expectancies, lower negative e-cig expectancies, and vaping that day because "tobacco is prohibited." Results suggest that regulatory efforts should counter the influence of normative approval of e-cigs, exposure to vaping by parents and peers, and exposure to e-cig marketing.

FUNDING: Federal; State

POD34-3

ADOLESCENTS USE OF E-LIQUID FLAVORS TO QUIT OR CUT DOWN CIGARETTE SMOKING: RESULTS FROM A 2017 SURVEY OF CONNECTICUT HIGH SCHOOL STUDENTS

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Significance: It is largely unknown how the use of flavored e-liquids relates to smoking cessation in youth. We determined the prevalence and predictors of using e-liquid flavors to quit/reduce smoking among adolescent current e-cigarette users who also smoked cigarettes. **Methods:** We conducted cross-sectional surveys in 4 CT high schools in Spring 2017 (n= 2,945) and restricted the analysis to 200 adolescents who reported current (past-30-day) use of e-cigarettes, ever use of cigarettes, and had non-missing data on a question assessing reasons for using e-liquid flavors (54% female, 85% white, Mean age = 16.6 [SD=1.1]). Adjusted logistic regression assessed associations of using flavored e-liquid to quit/cut down smoking (yes/no) with type of e-cigarette flavors used in the past 30 days (fruit, candy, menthol, mint, tobacco, other; Model 1), or total number of flavors used (0-6; Model 2) while controlling for demographics, past-30-day cigarette and e-cigarette use, and use of menthol cigarettes (yes/no). **Results:** Overall, 32.8% (n=62) of current e-cigarette users reported using flavored e-liquids specifically for the purpose of quitting/cutting down smoking. Compared to those who did not use e-cigarette flavors to quit/cut down smoking, adolescents who used flavors were more likely to use fruit e-liquid flavors (71.6% vs. 55.6%; p=0.03) and menthol cigarettes (62.9% vs. 24.6%; p < 0.001). In both adjusted models, using flavors to quit/cut down smoking was significantly associated with greater past-month frequency of e-cigarette use, greater past month frequency of smoking and using menthol cigarettes (p < 0.05), but not type of flavor used or number of e-liquid flavors used. **Conclusions:** This evidence suggests that use of flavors to quit/cut down smoking among youth is associated with frequency of e-cigarette and cigarette use and menthol cigarette smoking. Further research is needed to understand how to best regulate e-liquid flavors to promote tobacco abstinence among youth.

FUNDING: Federal

POD34-4

DO YOUNG ADULT POD-BASED E-CIGARETTE USERS SWITCH FROM CIGARETTES--A MIXED METHOD LONGITUDINAL STUDY

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Significance: Use of pod-based e-cigarette devices (e.g., JUUL) has risen rapidly, particularly among young adults. Few longitudinal studies investigate how and why users' tobacco use patterns change over time. **Methods:** Longitudinal study of 27 young adults (age 18-29, living in California at baseline, recruited via social media) using at least two tobacco products (e-cigarettes, cigarettes, or smokeless tobacco) in 2017 and who initiated pod-based e-cigarettes between 2017 and 2018. Participants completed in-depth interviews and surveys annually. Integrated analysis of qualitative and quantitative data determined patterns, perceptions and drivers of product use. **Results:** Participants shifted to using pod-based devices based on the aesthetic appeal, customizable qualities, powerful nicotine delivery, popularity among peers, norms about pod sharing, and utility for decreasing smoking. Participants expressed concerns about nicotine exposure and dependence. Two subgroups were identified by pod vape frequency (days per month) and intensity (times used per day): high frequency and high intensity (HFHI) and low frequency low intensity (LFLI). HFHI use was associated with lower maternal education, being in college, and younger age. At follow-up, the HFHI group rated their health worse than the LFLI group. Neither group reported changes in mental health. Three participants (all LFLI) reported quitting smoking cigarettes completely. HFHI users reported being significantly less likely to quit smoking cigarettes and more frequently reported they would be likely to smoke cigarettes in the next year compared to the LFLI group.

Nearly all participants estimated a high likelihood of continuing to smoke or relapse, including the three complete switchers. Nearly all participants were confident that they would continue using pod-based devices. **Discussion:** Young adult polytobacco users adopt pod-based devices for a variety of reasons. Complete switching was rare; most reported varying trajectories that included continued cigarette smoking. Future studies should address how college contexts influence pod vape use, and why HFHI use fails to result in complete switching.

FUNDING: Federal

POD34-5

THE RELATIONS BETWEEN E-CIGARETTE AND COMBUSTIBLE CIGARETTE DEPENDENCE AND DAILY USE PATTERNS AMONG DUAL USERS

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Background: Understanding dual users' dependence on combustible and e-cigarettes may provide important insights into long-term use patterns. This research examines real-time use patterns and their relations with dependence measures and long-term use. **Methods:** Dual users (defined by smoking daily for 3 months and using e-cigarettes at least once/week for the past month) not interested in quitting either product were recruited via TV and social media advertisements to participate in a longitudinal observational study. At baseline, participants completed measures of combustible and e-cigarette dependence (Fagerstrom Test of Nicotine Dependence [FTND], e-FTND, Wisconsin Inventory of Smoking Dependence Motives [WISDM], e-WISDM, Penn State Cigarette Dependence Index [PS-CDI], and PS-ECDI) and carried a study smartphone for 2 weeks to record cigarette and e-cigarette use events. **Results:** Most measures of dependence were product specific (e.g., FTND and e-FTND were not correlated, r=-0.003) and predicted product-specific outcomes. Morning use patterns powerfully predicted overall e-cigarette use heaviness and dependence. For instance, dual users who exclusively smoked first in the morning (29.8% of the sample) vaped a mean of 2.4 times/day (SD=1.7) while those who used e-cigarettes first in the morning on more than 50% of days (heavy morning vapers) vaped a mean of 10.3 times/day (SD=15.5). Relative to other use groups, heavy morning vapers had significantly higher e-cigarette and lower combustible cigarette dependence scores and greater likelihood of continued vaping at Year 1. **Conclusions:** Rather than being agnostic about the method of nicotine delivery, dependence appears to be product specific. However, e-cigarette dependence does appear to have a nomological network similar to that of combustible cigarette dependence such that there are clear positive relations among e-cigarette dependence measures, use of e-cigarettes first thing in the morning, lower dependence on combustible cigarettes, and greater long-term use of e-cigarettes.

FUNDING: Federal



POSTER SESSION 1

PS1-1

EFFECTS OF A 20-WEEK NICOTINE REDUCTION INTERVENTION ON SMOKING AND ALCOHOL OUTCOMES

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Background: A policy for reducing the nicotine content in cigarettes could improve public health by reducing cigarette smoking. It is important to evaluate any unintended consequences of such a policy on susceptible subgroups of smokers, like smokers who drink. Our analyses a) examined the impact of baseline drinking and associated problems on the effectiveness of very low nicotine content (VLNC) cigarettes, and b) evaluated the effect of VLNC cigarettes on alcohol outcomes over time among a subsample of smokers who drink. **Methods:** Secondary data analysis (N=752) was conducted of a randomized multi-site clinical trial of non-treatment seeking smokers assigned to receive VLNC or normal nicotine content cigarettes for 20 weeks (Hatsukami et al., 2018). Analyses adjusted for study site, employment status, nicotine dependence, nicotine metabolite ratio, age, gender, and race. **Results:** Baseline drinks per day and drinking problems (Short Michigan Alcohol Screening Test score) did not significantly moderate the effect of VLNC cigarette versus control on Week 20 smoking outcomes, including cigarettes per day, expired carbon monoxide, and urinary total nicotine equivalents. In a subsample of participants who drank alcohol at baseline (N=415), we used time-varying effect modeling to describe the effect of VLNC cigarette use (vs control) on daily alcohol use and binge drinking assessed using the timeline followback. We found that the effect of VLNC use on daily alcohol use emerged gradually over time. Daily alcohol use became significantly reduced in the VLNC vs control condition during Week 17 and this reduction continued to strengthen through the end of the observation period (Week 20). Odds of binge drinking was also significantly reduced in the VLNC vs control condition, specifically from Week 10 to 18. **Conclusions:** There was no difference in the effectiveness of the VLNC cigarette intervention on smoking-related outcomes between drinking and non-drinking smokers. Among smokers who drank, alcohol use and binge drinking were significantly reduced. Extended use of VLNC cigarettes may further improve public health by also reducing alcohol use and heavy drinking.

FUNDING: Federal

PS1-2

IMPACT OF A GRADUAL VERSUS IMMEDIATE NICOTINE REDUCTION IN CIGARETTES ON PERCEIVED HEALTH RISKS OF CIGARETTE SMOKING

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Background: Prior research shows that perceived—but not actual—nicotine content of reduced nicotine content cigarettes is associated with perceived health risks (PHR) of using these products. Less is known about whether the rate/method of nicotine reduction impacts PHR. **Methods:** Data are from a double-blind, randomized, trial in which participants were assigned to groups that varied the method of reducing nicotine in cigarettes to very low nicotine content (VLNC) (i.e., 0.4 mg/g). Nicotine content was: reduced immediately (Immediate); reduced gradually (Gradual); remained constant (15.8 mg/g; Control). Participants reported PHR of using study cigarettes (e.g., lung cancer risk) at Weeks 4, 8, 12, 16 and 20. Items were summed for a composite PHR score (0-60). At Week 20, participants reported perceived change in cigarette nicotine content during the study. We assessed associations between treatment group and PHR of study cigarettes over time; PHR and perceived change in nicotine content; and treatment group and perceived change in nicotine content. **Results:** At Week 20, PHR was lower among the Immediate (30.5) versus Gradual (35.9; $p < 0.001$) and Control

(33.7; $p = 0.046$) groups. PHR in the Immediate group decreased more rapidly than in Gradual ($p < 0.001$) and Control ($p = 0.005$) groups. The association between PHR and perceived change in nicotine content was significant ($p = 0.046$); persons perceiving that the nicotine content "changed early" reported lower PHR versus those perceiving nicotine content "stayed similar." Associations between treatment group and perceived nicotine content change were significant ($p < 0.001$). Forty percent of Control, 44.0% of Gradual, and 39.5% of Immediate groups correctly perceived the change in nicotine content of their cigarettes. **Discussion:** The rate/method of VLNC reduction may impact users' PHR of using those products. Perceived change in nicotine content over the course of the study was also associated with participants' PHR of using study cigarettes. Findings highlight the need for messaging and clarification regarding the persistent harms of VLNC cigarettes, particularly if an immediate VLNC reduction standard is implemented.

FUNDING: Federal

PS1-3

A RESIDENTIAL STUDY INVESTIGATING THE IMPACT OF VERY LOW NICOTINE CIGARETTES ON WITHDRAWAL, CRAVING, AND OTHER SUBJECTIVE EFFECTS

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The US Food and Drug Administration is considering a mandated reduction in the nicotine content of cigarettes. Clinical trials investigating nicotine reduction have shown that smokers who receive very low nicotine content (VLNC) cigarettes smoke fewer cigarettes per day and have reduced exposure to smoke and other toxicants, but the impact of nicotine reduction on subjective outcomes is less clear. While VLNC cigarettes are generally rated as less satisfying than normal nicotine cigarettes, data on withdrawal and craving have been mixed. One explanation for these inconsistent findings may be incomplete compliance to exclusively use VLNC when instructed to do so. Thus, it is difficult to extrapolate the results of these trials to a future regulatory environment with a comprehensive, mandated reduction in nicotine content. The present trial used an innovative method for testing the impact of nicotine reduction in the context of complete compliance. Using a within-subjects design, participants (N=16) completed two four-night stays at a local smoking-friendly hotel, during which they had exclusive access to normal nicotine content (NNC) (Week 1) or VLNC (Week 2) cigarettes. Participants completed a variety of questionnaires including the 15-item Minnesota Nicotine Withdrawal Scale, Brief Questionnaire of Smoking Urges, and modified Cigarette Evaluation Questionnaire. There was no significant effect of nicotine content on cigarettes smoked per day (mean difference (MD)=1.13, 95%CI=-0.41, 2.66, $p = 0.15$). However, compared to the NNC condition, there was a significant, but mild, increase in withdrawal (MD=3.19, 95% CI=1.77, 4.60, $p < 0.001$). There was no increase in craving to smoke associated with the VLNC condition. Although smoking rate was unchanged, VLNC cigarettes were rated significantly lower than NNC cigarettes on subjective effects like satisfaction (MD=-1.8, 95% CI=-2.31, -1.3, $p < 0.001$). These data confirm that under conditions of complete compliance with VLNC cigarettes, and in an unblinded design, withdrawal is likely to be mild. Consistent with clinical trials, smokers are less satisfied with VLNC cigarettes than NNC cigarettes.

FUNDING: Federal

PS1-4

PARTICIPANT EXPERIENCES WITH EXCLUSIVELY SMOKING VERY LOW NICOTINE CONTENT CIGARETTES: INTERVIEWS FROM A RESIDENTIAL STUDY

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Background: The Food and Drug Administration is considering a low-nicotine product standard for cigarettes. To date, no in-depth interviews have been conducted among smokers with extended access to very low nicotine content (VLNC) cigarettes, which may capture subjective experiences not measured by quantitative assessments. Thus, the purpose of this qualitative study was to explore smokers' experiences after 72 hours of exclusively smoking open-label VLNC cigarettes. **Methods:** We interviewed smokers (N=16) participating in an unblinded, residential study on nicotine reduction during which they stayed in a smoking friendly hotel with access to only VLNC cigarettes. Participants



were asked about their acute experiences with smoking the VLNC cigarettes, expectations of VLNC cigarettes, and opinions regarding a nicotine reduction policy. Individual interviews were transcribed verbatim and analyzed using content analysis methods. Results: Participants were on average 38.9 years old (SD=11.3), 50% female, and smoked 14.8 (SD=6.4) cigarettes per day at baseline. A subset of participants reported mild withdrawal and craving symptoms but the majority did not report symptoms. Several participants stated they expected to increase their smoking and experience major withdrawal symptoms due to the reduced nicotine levels. There were misperceptions of reduced harms from smoking VLNC cigarettes as well as misunderstandings about the purpose and potential benefits of a nicotine reduction policy. Opinions were mixed about policy support and the optimal approach for implementation (immediate vs gradual nicotine reduction). Finally, a subset of participants expressed interest in quitting after the study ended. Discussion: In general, most participants reported minimal discomfort after exclusively smoking VLNC cigarettes and many acknowledged that their initial negative expectations for smoking VLNC cigarettes were not actualized. However, VLNC cigarette misperceptions were common. Together, these findings suggest that health communication strategies are needed to inform smokers about what to expect from a nicotine reduction policy in order to maximize the public health impact.

FUNDING: Federal

PS1-5

ADOLESCENT RESPONSE TO USING SPECTRUM CIGARETTES: QUALITATIVE RESULTS FROM AN ONGOING CLINICAL TRIAL

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As the FDA considers whether to enact a nicotine product standard, clinical trials are ongoing to determine adolescents' response to such a policy. Adolescent daily smokers (ages 15-19 inclusive, N=52, mean age =18.5, average cigarettes per day = 8.1) were enrolled in an ongoing double-blind, randomized clinical trial that asked them to switch to smoking only SPECTRUM cigarettes for three weeks (either normal nicotine [NNC; 15.8 mg nicotine/g tobacco] control (n=27) or very low nicotine content [VLNC; 0.4 mg/g] cigarettes (N=25); target N=64). At the end of the three weeks, participants completed an interview in which they were asked what they liked and disliked about their research cigarettes and how their smoking would be affected if their research cigarette was the only type available. Thematic codes were developed by RNC based on the interview script and refined iteratively to reflect emergent themes. Interviews were transcribed and independently coded by RNC and JD using nVivo software. The most common themes to emerge were overall lack of satisfaction with research cigarettes across both nicotine conditions. Reasons for dislike included harshness, bad taste, and a general difference from their usual brand. In some cases, this dislike led to difficulties remaining compliant with study cigarette use. Overall, the majority of participants in both groups were likely to report a that they would quit or cut down their smoking if their study cigarette was the only type available; though others reported that they would not change their behavior or would use alternative products. This sensitivity to aversive sensations derived from both VLNC and NNC research cigarettes illustrates the potential mechanisms underlying existing data, which suggest that adolescent smokers may be less sensitive to differences in nicotine dose in research cigarettes than adults across some measures of reinforcing efficacy. These results highlight the need for continued research on how nicotine reduction may affect youth smoking.

FUNDING: Federal

PS1-6

EVALUATING THE UTILITY OF COMPUTATIONAL AND CHEMINFORMATIC ANALYSES TO SCREEN FOR POTENTIAL TOXICOLOGICAL HAZARD OF FLAVOR COMPOUNDS RELEVANT TO TOBACCO PRODUCTS

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Currently, there are thousands of unique flavoring compounds available for use in electronic nicotine delivery systems (ENDS). Given the wide number of chemically defined flavors, the mixtures comprising e-liquid cartridges for use in ENDS are complex, warranting the investigation of alternative methods to evaluate the potential for hazard. As nonclinical testing of compounds is resource-intensive, the results presented here evaluate the utility of two different modeling systems to support the prioritization of compounds for comprehensive toxicological evaluation: (1) predictive computational

modeling and (2) cheminformatic analyses. Both expert-based (i.e., SAR) and statistical-based systems (i.e., QSAR) were employed using multiple computational toxicology software platforms combined with expert knowledge. Compiled empirical mutagenicity data for flavor compounds in the dataset were used to evaluate the performance of the (quantitative) structure-activity relationship ((Q)SAR) modeling systems. Overall, both (Q)SAR systems more accurately predicted non-mutagenic compounds (80.3-95.9%) as compared to mutagenic compounds (30.9-60.9%). To further identify structural alerts associated with mutagenic flavoring chemicals, chemical structures were distilled into 2-dimensional space and analyzed using cheminformatic software. Overlapping chemical moieties associated with mutagenic compounds were compiled and resulted in the identification of five major chemical fingerprints associated with mutagenicity that have not been previously reported: a quinoline, furanone, styrene oxide, pyrrole, and thiazole. Identification of these structural fingerprints may be useful to support a read-across analysis for compounds lacking empirical toxicological data. Overall, computational and cheminformatic modeling systems provide a useful tool in supporting the hazard identification of flavor compounds and may generate predictive data useful in prioritizing compounds for further toxicological evaluation.

FUNDING: Unfunded; Federal

PS1-7

NATIONAL TOBACCO CONTROL POLICIES FROM THE PERSPECTIVE OF SINGAPORE YOUNG MALE ADULTS

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Significance: Between 2016 and 2018, tobacco control legislations have undergone several amendments to further restrict tobacco use in Singapore. These included tobacco tax increase, point-of-sale display bans and raising the minimum legal age for smoking from 18 to 21 years. Currently, little is known about how Singaporean young smokers view recent national tobacco control policies. This study explored the attitudes towards these policy changes and the perceived effectiveness of legislations from the perspectives of young male adults in Singapore. Methods: This study was conducted from March to June 2018. Qualitative data were collected in the form of semi-structured telephone interviews with 29 participants, who have completed their National Service in 2017/18 and self-reported as a smoker at the pre-enlistment screening. Results: Young male smoker perspectives on Singapore tobacco policies including taxation, smoke-free environments, point-of-sale display bans on tobacco products, graphic health warnings, and raising the minimum legal age of smoking to 21, were evaluated. Participants held the view that cigarette pricing to be a highly effective approach to control their smoking behaviour because it has a direct impact on their tobacco affordability, and they shared that the least effective was point-of-sale display ban and graphic health warnings. In general, participants felt that the policy change would have some effect on discouraging people from smoking by delaying the onset of smoking and denormalization. Conclusion: Our study findings showed that participants were well aware of the national tobacco control policies, but they did not always fully accept them or understand the rationale behind them. This highlighted that tobacco control measures should be implemented along with public education to correct misperceptions and increase public support for tobacco control measures in Singapore.

FUNDING: Academic Institution

PS1-8

STRENGTHENING A TOBACCO-FREE COLLEGE CAMPUS POLICY THROUGH SIGNAGE: GIS MAPPING FOR ADVOCACY TO IMPROVE IMPLEMENTATION

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SIGNIFICANCE: The implementation of tobacco-free policies on university and college campuses has become increasingly common. These policies are known to promote the wellbeing of faculty, staff, and students. However, promoting policy compliance has remained a challenge. Therefore, it is important to develop strategies that can overcome barriers to successful policy implementation and promote compliance. This abstract presents a case study of a practical strategy for addressing poor implementation of a newly adopted tobacco-free policy. It was developed when, 10 months after a tobacco-free policy went into effect on a large southeastern university, signage had not been updated and cigarette butt receptacles remained in no-tobacco-use areas.



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METHODS: Following principles of advocacy research, a team of student researchers and a faculty advisor collaboratively developed a protocol to identify tobacco-related signage and environmental cues for tobacco use (e.g., cigarette-butt receptacles, designated smoking areas) on campus. After training, we canvassed the campus on foot, following the protocol. When a surveyor encountered a tobacco-related sign or environmental cue, they reported information about that item, including its type, message, and location. **RESULTS:** Ten months after a tobacco-free campus policy went into effect, we identified 153 signs and 65 environmental cues. Of these, only two signs accurately described the current policy. Approximately 97% (n=63) of the environmental cues were in no-tobacco-use areas. Dissemination of maps to campus stakeholders resulted in attention from high-level administrators, meetings with facilities personnel, and movement towards more consistent signage. We provide recommendations that can be used to improve upon our method. One challenge others may face when seeking to emulate this technique is the inaccuracy of GPS technology. **CONCLUSIONS:** Adoption of a policy may not be adequate. Mapping of campus signage and cues to use tobacco can be an important advocacy tool to improve implementation of tobacco-free campus policies. Attention is needed to support policy implementation after adoption.

FUNDING: State

PS1-9

PRELIMINARY EFFICACY OF THE QUIT TOGETHER COUPLE FOCUSED PREGNANCY SMOKING CESSATION INTERVENTION IN ROMANIA

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Significance: Smoking rates before and during pregnancy are high in Romania and other low and middle income countries. This research reports preliminary findings on the efficacy of a smoking cessation intervention for couples during and after pregnancy in Romania. **Methods:** The Quit Together trial enrolled participants between 2017-2019. The target population was comprised of pregnant smokers and their life partners in Romania. Eligibility criteria included age \geq 18; pregnant; smoker; married or with a stable partner; willing to share partner contact info to be invited as participants as well. Participants self-enrolled through the Quit Together project webpage responding to Facebook ads and Google AdWords ad campaigns, and promotion through emails, online discussion groups, and printed materials distributed nationally by perinatal educators in ObGyn clinics and other relevant locations. Quit Together is a telephone counselling program building on the Motivation and Problem Solving (MAPS) approach enhanced by targeting the couples' smoking behavior and focusing on dyadic efficacy for smoking cessation. We report preliminary efficacy results of Quit Together. **Preliminary Results:** The total number of pregnant smokers with confirmed enrollment in the Quit Together trial was 130. Among those who completed the intervention, the postpartum follow-up rate was close to 87% (N=47/52). The mean age was 28, ranging from 18 to 42. Over 42% graduated college. Over 62% of the pregnant smokers had moderate-high nicotine dependence. Interim smoking cessation efficacy analyses on the first 52 participants indicate that the self-reported quit rate was 29.6% in the intervention group (8/27) vs 20% in the control group (5/25). Biochemically confirmed quit rates were 11.1% (3/27) vs 8% (2/25). **Conclusion:** This preliminary analysis of data from a randomized controlled using indicates that motivation and problem-solving telephone counseling with couples can increase smoking cessation during pregnancy. These interim findings suggest that Quit Together may be an efficacious program for prenatal smoking cessation.

FUNDING: Federal

PS1-10

REGULATING NON-TOBACCO HOOKAH ESTABLISHMENTS IN NEW YORK CITY

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Significance: Despite declines in cigarette smoking in New York City (NYC), hookah smoking is a growing trend, particularly among youth. Between 2008 and 2016, the percentage of NYC middle school students who have smoked hookah nearly doubled from 2.9% to 5.6%. Moreover, the percentage of NYC high school students who have smoked hookah is 16.4%. At the same time, there are many misconceptions about the health risks associated with hookah smoking. Youth often mistakenly perceive it as a healthy alternative to cigarettes. In fact, regardless of the tobacco content of the

shisha, hookah smoke contains many of the same dangerous chemicals found in cigarette smoke. The landscape of hookah availability has also changed. Based on Yelp searches, it is estimated that the number of hookah establishments in NYC increased four-fold, from 84 in 2012 to 390 in 2017. Although smoking in restaurants and bars was prohibited by the 2002 NYC Smoke Free Air Act (SFAA), the definition of smoking was limited to tobacco products. A 2014 NYC Health Department investigation of 13 hookah establishments found that all of them were illegally serving tobacco-containing shisha to underage customers, a finding consistent with prior studies and the experience of health inspectors. The simultaneous rise in youth use of hookah and proliferation of establishments were of concern and prompted City action. **Policy Development:** In October 2017, NYC adopted three laws regarding hookah. These: 1) created a new non-tobacco hookah establishment permit and expanded the SFAA to include non-tobacco shisha, except in permitted establishments, 2) required all hookah establishments to post signs that warn customers of the negative health effects associated with hookah smoking, and 3) updated the Tobacco 21 law to ban the sale of non-tobacco shisha to persons younger than 21. **Conclusion:** These laws will protect the health of New Yorkers by limiting the rise in hookah establishments, informing New Yorkers about the health risks of hookah smoke (including from non-tobacco shisha), and reducing youth access. They may also serve as a model for other jurisdictions.

PS1-11

COMPARING E-LIQUID FLAVORING INGREDIENTS BETWEEN DIFFERENT FLAVOR CATEGORIES USING CHEMICAL ANALYSIS

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Significance: E-liquids are marketed in thousands of different flavors that can be classified in categories such as fruit, alcohol, candy, dessert, or tobacco. Flavoring ingredients may contribute to e-liquid toxicity and attractiveness. Data relating flavoring composition to an e-liquid's flavor category are limited. This study aims to identify similarities and differences in e-liquid flavoring compositions between particular flavor categories. **Methods:** A targeted gas chromatography - mass spectrometry approach was used to identify 83 flavoring compounds and quantify 10 of those, in 322 e-liquids with 205 unique flavors, varying in nicotine concentration and glycerin level. E-liquids were classified in 15 main categories of our previously published e-liquid flavor wheel. The most frequently used flavorings, and differences in frequency of use and flavoring concentrations between the flavor categories were determined. **Results:** Whereas some flavorings were commonly used across all or most flavor categories, we also identified flavoring compounds that were specific to a particular category. Mean concentrations of vanillin (vanilla-like flavor), ethyl maltol (fruity-caramellic), ethyl butyrate (fruity), ethyl acetate (ethereal odor), maltol (fruity), ethyl vanillin (vanilla-like), furaneol (fruity), methyl cyclopentenolone (caramellic), γ -decalactone (peach-like), and cis-3-hexenol (fresh odor) differed between the flavor categories. **Conclusions:** This study used a simple and pragmatic GC-MS method to identify and quantify target flavorings in a large sample of e-liquids with different marketed flavors. Our results can help policy makers in developing measures for flavor regulation in order to decrease attractiveness and toxicity of e-cigarettes. To decrease product appeal for vulnerable user groups (i.e. non-smokers and youth), regulation may focus on flavoring ingredients characteristic for the flavor categories that are particularly popular among these target groups.

FUNDING: State

PS1-12

SENSORY EVALUATION OF E-LIQUID FLAVORS BY SMELLING AND VAPING YIELDS SIMILAR RESULTS

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Significance: Sensory research on e-liquid flavors can be performed by means of smelling and vaping. Smelling is faster, cheaper, and associated with less restrictions regarding the study population than vaping. However, data comparing smelling versus vaping e-liquid flavors is lacking. This study aims to investigate if smelling could be an alternative to vaping experiments by determining the correlation for hedonic flavor assessment between orthonasal smelling and vaping of e-liquids, for smokers and non-smokers. **Methods:** Young adult smokers (n=24, mean age 24.8 \pm 9.3) and non-smokers (n=24, mean age 24.9 \pm 7.7) smelled and vaped 25 e-liquids in various flavors. Participants rated liking, intensity, familiarity, and irritation on a 100 mm Visual Analogue Scale. Pearson correlations within and between smelling and vaping were



calculated. Differences between user groups were calculated using t-tests. **Results:** Correlation coefficients between smelling and vaping based on mean group ratings were 0.84 for liking, 0.82 for intensity, 0.84 for familiarity, and 0.73 for irritation. Means of the within-subjects correlation coefficients were respectively 0.51, 0.37, 0.47, and 0.25. Correlations between smelling and vaping varied across individuals (ranging from -0.27 to 0.87) and flavors (-0.33 to 0.81). Correlations and mean liking ratings did not differ between smokers and non-smokers. **Conclusions:** The strong group-level correlations between smelling and vaping justify the use of orthonasal smelling (instead of vaping) e-liquids to measure hedonic flavor perception in some studies where vaping would be inappropriate or not feasible. Examples of research situations where smelling e-liquids can be sufficient are investigating nicotine-naïve individuals (i.e. non-users), investigating individuals under legal age for e-cigarette use (i.e. youth and adolescents), investigating brain responses to exposure of e-liquid flavors using fMRI, and comparing hedonic flavor assessment between adolescent non-users and current smokers to provide support for future regulations on e-liquid flavors. The more modest within-subject correlations and variation across individuals and flavors merit caution in using smelling instead of vaping in other types of experiments.

FUNDING: State

PS1-13

USING DATA ON E-LIQUID FLAVORING INGREDIENTS TO PREDICT AN E-LIQUID'S FLAVOR CATEGORY

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Significance: Flavors increase e-cigarette appeal and may stimulate use among vulnerable groups such as non-smoking adolescents. Regulators should monitor the market to gain insight in, and regulate the range of e-liquid flavors that is available to consumers. Creating overviews of e-liquids and flavors available by analyzing Web shops is highly time-consuming and challenging due to the market's dynamic character. We recently used data from manufacturers to generate an overview of flavored e-liquids available on the Dutch market by manually classifying e-liquids into 16 flavor categories. However, 2,586 e-liquids could not be classified due to insufficient flavor-related information and manual classification is time-consuming. This study aimed to automate the classification process to make it faster and less dependent on limited or vague flavor-related information by predicting e-liquids' flavor categories based on their flavoring compositions. **Methods:** A dataset from manufacturers containing 16,839 e-liquids and their ingredients was used. E-liquids were previously classified based on flavor-related information into 16 categories of the e-liquid flavor wheel. Quantitative and qualitative ingredient data were used to predict e-liquid flavor categories using a random forest machine-learning algorithm. **Results:** Using data on ingredient quantities, 9,982 of 14,253 e-liquids (70%) were assigned to the correct flavor category. For 3,740 incorrectly assigned products (26% of total e-liquid sample), the correct category received the second highest number of votes. The overall prediction accuracy was 66% when using qualitative data. All e-liquids that could not be classified manually were assigned to a flavor category by the algorithm. **Conclusions:** Applying a machine-learning algorithm to a dataset on e-liquid flavoring compositions can provide a quick and reliable estimation of marketed e-liquid flavors and their distribution across categories, even when only qualitative ingredient data is used. We recommend other jurisdictions to request similar datasets and/or perform similar analyses, to facilitate comparative analyses between regions and countries.

FUNDING: State

PS1-14

UKRAINE'S SEVEN-YEAR PLAN TO INCREASE TOBACCO TAXES: TACTICS AND ARGUMENTS OF OPPONENTS AND PROPONENTS

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Background: Ukraine passed the Seven-Year Plan to increase taxes on cigarettes to meet the tobacco excise tax requirements outlined in the Ukraine-European Union Association Agreement (U-EUAA). Given that increasing the price of tobacco products is one of the most effective policy interventions and medium- to long-term plans are rarely passed, we analyzed the passage of this unique legislation to learn more about the factors, tactics, and arguments underlying its passage. **Methods:** A case study approach including key informant interviews (N=12) and document review (N=21) was used to qualitatively assess factors, tactics and arguments important to passing the Seven-Year Plan. Interview transcripts and documents were analyzed using both inductive and deductive coding.

Results: Proponents sensitized decision-makers and used media advocacy, partnership building, and dissemination of scientific evidence. Proponents refuted industry claims that increasing the tax too quickly would increase smuggling, damage the industry, and reduce government revenue. They also used country-specific data and statistical modeling to show that tobacco taxes have a progressive effect on the poor and illustrate reductions in morbidity and mortality that would result from higher taxes. Opponents engaged in lobbying, often behind closed doors where it was difficult to counter. It is suspected that this lobbying resulted in concessions to the industry, including pegging the tax to Ukrainian currency (not the Euro) and changing the annual inflation adjustment from mandatory to optional. The external pressure imposed by the U-EUAA and the need for additional government revenue put proponents in a strong position to advocate for incremental tax increases, but industry interference prevented it from actually reaching U-EUAA requirements. **Discussion:** The need to employ lobbying, multisectoral partnerships, and scientific evidence is critical, but can still be undermined by industry interference. A concurrent focus on passing legislation requiring transparency of government-tobacco industry interactions in line with guidelines for article 5.3 will additionally support tobacco control policy work.

FUNDING: Nonprofit grant funding entity

PS1-15

MARIJUANA AND TOBACCO SMOKING RULES IN DENVER AIRBNB VENUES

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Background: Smokefree air regulations have contributed to reductions in indoor combustible tobacco use, but marijuana legalization introduces interesting challenges. Airbnb is an online short-term housing rental platform and rules about marijuana or tobacco use in rentals are generally established by the host and detailed in the online listing. We sought to assess the prevalence and nature of host rules about marijuana and tobacco use in Airbnb venues in Denver, Colorado, which legalized recreational marijuana use in 2014. **Methods:** The study used publicly available data from InsideAirbnb, collected June 29, 2017. InsideAirbnb is an independent, non-commercial entity that collects all available data from every listing in certain cities. Keyword searches using the terms "420", "marijuana", and "weed", and identified listings that reported rules about marijuana use. This resulted in a sample of N=4,511 Airbnb listings from Denver, including venue descriptions and house rules. Each listing with at least one of these keywords was reviewed and the venue was categorized as marijuana allowed or marijuana not allowed. Across the entire sample, venues were further classified based on reported house rules as cigarette "smoking allowed" or "smoking not allowed." **Results:** Approximately 9% of Airbnb listings in Denver (n=406) were classified as "smoking allowed". Approximately one quarter of all Denver listings (23%, n=1,047) include details about marijuana use. Within the sample of venues that had marijuana use rules, most permitted use (76%, n=800). Of the venues that allowed marijuana use, a minority allowed cigarette smoking (19%, n=204). Of the venues that did not allow marijuana use (n=247), less than 1% (n=1) allowed cigarette smoking. **Discussion:** Approximately 1 in 6 Airbnb venues in Denver explicitly allow marijuana use and 1 in 11 venues allow cigarette smoking. More venues that allow marijuana use also allow cigarette smoking, compared to venues that do not allow marijuana use, which may suggest a weakening of smokefree air regulations. Airbnb could consider including marijuana use in house rules in jurisdictions that have legalized marijuana to help guests enjoy spaces with clean air.

FUNDING: Unfunded

PS1-16

WORKPLACE SMOKING POLICIES AND SUPPORT FOR SMOKING CESSATION OFFERED TO EMPLOYEES WHO SMOKE IN THE US IN THE PERIOD FROM 2010 TO 2015

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Significance: For employed adults, smoking policies at the workplace are the primary means for reducing tobacco consumption and exposure to second-hand smoke. The study goals were to estimate the changes in the percentage of workplaces with smoking restrictions and percentage of workplaces with support for smoking cessation within US states and overall, from 2010-11 to 2014-15. **Methods:** In the study we used the Tobacco Use Supplement-Current Population Survey (TUS-CPS) reports of employed adults (n=112,008) regarding smoking restrictions at their indoor workplaces and support



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for smoking cessation offered at their workplaces in the US. Analyses adjusted for the TUS-CPS complex design features. Results. The percentage of employed adults who reported that smoking restrictions existed at their workplaces was about 93%. While the percentage of employees who reported that smoking restrictions existed at their workplaces was very high (90% or above) in almost all states in 2014-15, there was a decrease (all p -values <0.05) from 2010-11 to 2014-15 in Hawaii, New York, Oregon, Pennsylvania, and Tennessee and increase in Indiana, Nebraska, and Wyoming. The percentage of employees who reported that their workplaces offered support for smoking cessation was about 26.6%. The percentage increased (all p -values <0.05) in 31 states and the District of Columbia and decreased in Hawaii; the highest 2014-15 percentages (40.0% or above) corresponded to Oregon, Minnesota, Wisconsin, Maine, and Vermont; and the lowest 2014-15 percentages (20.0% or below) corresponded to Hawaii and Louisiana. Analysis of smokers' reports resulted in lower percentages of workplaces with smoking restrictions (91.5%) and cessation support (22.4%). Conclusions. While the majority of workplaces have policies regulating smoking indoors, less than a third of workplaces offer support for smoking cessation to their employees. There is a need to improve employees' awareness of existing support for smoking cessation, as well as the type and quality of this support offered at workplaces in the US.

FUNDING: Federal

PS1-17

BECOMING A VAPER: THE EXPERIENCES OF YOUNG ADULTS IN ONTARIO

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Significance: There has been a dramatic increase in the number of Canadian youth and young adults who vape. Between 2017 and 2018, regular vaping among Canadian youth aged 16-19 years old has increased by 74%¹. There is a lack of qualitative research in Canada that examines the vaping experience among young people. This qualitative study sought to better understand the factors that shape initiation and progression to regular vaping status in young people in Ontario, Canada. **Methods:** We conducted 8 focus groups in three large urban cities in Central and South West Ontario. A total of 36 vapers and non-vapers (17-24 years old) participated in the focus groups held between November 2018 and January 2019. Sixty one percent of participants were never vapers, while 39% were daily vapers. The semi-structured interview guide covered the following topics: cultures and environments, health concerns, and the marketing of vaping products. Data were analyzed using a thematic interpretive approach. Themes from interviews and focus groups were then compared and contrasted by age and vaping status. **Results:** All participants, regardless of vaping status, agreed that vaping had become normalized in their communities through both social exposure (i.e. seeing others vape), media and marketing exposure online (i.e. social media, celebrities, movies, etc.) and the steady increase in the number of peers who vape. Participants generally felt that young people start vaping because of curiosity, social pressure (in particular friends), social media influence, and stress. Participants who vaped perceived that the progression to regular use resulted from more frequent use (i.e. at parties, at school, with friends) and from owning their own device. Although some participants perceived vaping as a safer alternative to cigarettes, others disagreed with this. Regardless of regular and frequent use, many young people had no concerns about becoming addicted to nicotine. **Conclusions:** This study provides insights into why and how young people initiate and progress to regular vaping in a regulatory environment with limited marketing restrictions. **References** 1. Hammond, D., Reid, J.L., Rynard, V.L., Fong, G.T., Cummings, K.M., McNeill, A., ... & White, C.M. (2019). Prevalence of vaping and smoking among adolescents in Canada, England, and the United States: repeat national cross sectional surveys. *BMJ*, 365, l2219. Doi: 10.1136/bmj2219.

FUNDING: Other

PS1-18

PERCEIVED ADDICTION TO VAPING AMONG YOUTH AND YOUNG ADULT REGULAR VAPERS

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Significance The prevalence of e-cigarette use among youth and young adults has increased markedly in recent years. Despite this increase, little is understood about addiction to e-cigarette use, young people's perceptions of addiction and what is associated with such perceptions. This study examines variables associated with self-reported addiction to e-cigarette use in order to identify opportunities for intervention. **Methods** In 2018, 1048 16-25 year old Canadians were recruited through online social media platforms to complete a survey. Quota sampling was used to target 60% of the total sample to be regular e-cigarette users, and the remaining 40% to be non-regular or never e-cigarette users. This analysis included the 598 regular e-cigarette users. The primary outcome was self-perceived addiction to e-cigarettes, assessed by asking participants if they felt as though they were addicted to e-cigarettes. Descriptive characteristics between outcome groups were compared using chi-square and t-tests. Separate logistic regression analyses examined associations with any level of perceived addiction compared to no perceived addiction, and then between those with perceptions of being somewhat vs. very addicted. **Results** More than half of the sample (54%, $n=313$) reported some level of addiction to e-cigarettes. Daily e-cigarette use, the use of higher nicotine strengths, engaging with online e-cigarette content and being female were associated with increased odds of perceived addiction. **Conclusion** This study contributes new knowledge about the factors associated with addiction to e-cigarettes among youth and young adults. The findings identify opportunities for policy change regarding maximum allowable nicotine strengths, individual-level interventions where behaviours associated with addiction are observed, and directions for future research into sex-differences in perceived addiction.

FUNDING: Other

PS1-19

POLICY SUPPORT FOR PROHIBITING CIGARETTE AND E-CIGARETTE USE IN MULTIUNIT HOUSING AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF US ADULTS

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Significance: Individuals living in multi-unit housing (MUH) are disproportionately exposed to secondhand smoke (SHS) and e-cigarette vapor from neighboring units. Smoke free air policies reduce SHS exposure and change tobacco use social norms. Given the concern of increased e-cigarette use, estimating public support for prohibiting MUH e-cigarette and cigarette use can guide efforts to protect MUH residents. **Methods:** Data were collected Fall 2018 from a nationally representative online panel of US adults 18-64 years old ($n=3415$). Weighted bivariate analyses examined the association of demographics and tobacco use with support for prohibiting 1) cigarette use and 2) e-cigarette use in MUH. **Results:** Support for prohibiting MUH cigarette use ordinally increased as income increased, with 66.3% of those earning $< \$25,000$ supporting the policy versus 81.3% of those earning $> \$74,000$ ($p<0.001$). Income and support for prohibiting MUH e-cigarette use were not significantly associated. Support for prohibiting MUH cigarette use varied by smoking status (83.3% never, 74% former, 52.2% current smokers, $p<0.001$). Smoking status was also associated with support for prohibiting MUH e-cigarette use (81.5% never, 66.4% former, 55.8% current smokers ($p<0.001$)). Current e-cigarette (47.4%) and e-cigarette/cigarette dual users (48.6%) had lower levels of support for prohibiting MUH cigarette use than non-current users (80.3%, $p<0.001$). Support for prohibiting MUH e-cigarette use was lower among current e-cigarette (38.1%) and current e-cigarette/cigarette dual users (43.9%) versus non-current users (77.6%, $p<0.001$). **Conclusion:** Although low-income individuals are more likely to live in and be exposed to SHS in MUH, they had the lowest level of support for prohibiting cigarette use but did not differ in support for prohibiting e-cigarette use. Notably, support for both policies was low among current e-cigarette users but the majority of current smokers supported both policies. The low levels of support among these priority groups needs to be examined given the rise in e-cigarette use in the US and potential of shifting social norms toward increased acceptability of tobacco use in MUH.

FUNDING: Other

PS1-20

EXAMINING KEY CHARACTERISTICS OF US STATE-LEVEL E-CIGARETTE TOBACCO RETAIL LICENSING LAWS

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Significance: Tobacco retail licensing (TRL) laws are important for regulating tobacco product sales, preventing sales to minors, and requiring compliance with other tobacco-related laws. Despite the dramatic rise in e-cigarette use, especially among adolescents, few studies have examined how states regulate e-cigarette sales through e-cigarette-specific TRL laws. **Methods:** We coded all 18 state-level e-cigarette TRL laws in existence and enacted by 9/30/2018. Statutes were double coded for components necessary for an administratively sufficient law: clear license term, required fee, identification of the agency responsible for administration/enforcement, and penalties for violations. We also coded other regulatory components, including license fee amounts, how fees are directed, how e-cigarettes are defined, and youth access provisions. **Results:** Overall, 16 states (89%) had a clear license term and 17 states (94%) required a licensing fee. License fees ranged from \$5 to \$500 annually. However, in 4 states (22%) license fees were not directed toward TRL administration/enforcement. In total, 94% of states identified the administrative agency. All states identified license violations and associated penalties. Approximately 14 states (78%) included both nicotine and non-nicotine products in their e-cigarette definition and 6 states (33%) included e-cigarettes in their definition of tobacco products. Nearly all (94%) states had the same minimum sales age for e-cigarettes as cigarettes and one state restricted e-cigarette sales near schools or youth-oriented areas. **Conclusion:** Most state laws include a minimum sales age and contained components that are necessary for an administratively sufficient e-cigarette TRL law. Several states, however, had low license fee amounts, did not explicitly direct license fees toward enforcement, did not provide a comprehensive e-cigarette definition, or did not have retailer location restrictions, all of which may lead to difficulty enforcing the law and preventing youth access. As e-cigarette use increases, especially among youth, states should consider incorporating these components into new or existing TRL laws.

FUNDING: Other

PS1-21

SECONDHAND SMOKE EXPOSURE IN PUBLIC AND PRIVATE HIGH-RISE MULTIUNIT HOUSING SERVING LOW-INCOME RESIDENTS IN NEW YORK CITY PRIOR TO FEDERAL SMOKING BAN IN PUBLIC HOUSING, 2018

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Background: Tobacco remains the leading cause of preventable death in the United States. On July 30, 2018, the U.S. Department of Housing and Urban Development passed a rule requiring public housing authorities to implement smoke-free housing (SFH) policies. **Objectives:** Pre-SFH policy implementation, we measured self-reported and objective secondhand smoke (SHS) incursions in 21 purposefully-selected residential high-rise developments in New York City (NYC) serving low-income residents, including public housing and private sector buildings. **Methods:** We conducted a baseline telephone survey targeting all residents of: (a) 10 NYC Housing Authority (NYCHA) buildings in April-July 2018 (n=559), and (b) 11 private sector residential buildings (where most residents received federal housing subsidies, herein 'Section 8' buildings) in August-November 2018 (n=471). All buildings were high-rise structures (>15 floors). We invited non-smoking household participants to enroll into an air monitoring study to track SHS exposure using: (1) nicotine concentration from passive, bisulfate-coated nicotine filters and (2) particulate matter (PM_{2.5}) from low-cost particle monitors. SHS was measured for 7-days in non-smoking households (NYCHA n=157, Section 8 n=118 households) and building common areas (n=91 hallways and stairwells). **Results:** Smoking prevalence among residents in the 21 buildings was 15.5%. Two-thirds of residents reported seeing people smoke in common areas in the past year (67%) and 60% reported smelling smoke in their apartments coming from elsewhere. Most stairwells (88%) and hallways (74%) had detectable nicotine levels, but nicotine was detected in only 10% of non-smoking apartments. Substantial variation in nicotine and PM_{2.5} was observed between and within buildings; on average nicotine concentrations were higher in NYCHA apartments and hallways than in Section 8 buildings (p<0.05), and NYCHA residents reported seeing smokers in common areas more frequently. **Conclusions:** SFH policies may help in successfully reducing SHS exposure in public housing, but widespread pre-policy incursions suggest achieving SFH will be challenging.

FUNDING: Federal

PS1-22

EXPLORING THE INTERSECTION OF TOBACCO USE, ENVIRONMENTAL CO-EXPOSURES, AND TOBACCO CONTROL POLICY PRESENCE IN TOBACCO NATION

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Significance: Tobacco and environmental health disparities put communities at higher risk of negative health outcomes, though few studies examine this intersection. Populations with high smoking prevalence, such as those in the 13 states across the Midwest and South termed Tobacco Nation (TN), may be particularly vulnerable to environmental risks. **Methods:** County-level environmental quality index scores (EQI) from the Environmental Protection Agency (EPA) and smoking prevalence data (Behavioral Risk Factor Surveillance System) were used to create a joint smoking-environmental co-exposure index (JSEC). We constructed a county-level smoke-free indoor air index (SFIA) as a proxy to assess tobacco control environment strength. We conducted neighboring cluster analyses with JSEC and SFIA indices to highlight areas that may benefit from stronger policies. Analyses were repeated for Census Tracts (CT) using EPA particulate matter (PM) data. **Results:** JSEC scores were constructed for 3,142 counties and 74,001 CTs. Approximately 45% (n=479) of TN counties were in the top 20th national smoking percentile. EQI scores were highest in the upper Midwest, coastal New England and the West Coast, with 16.7% (n=177) of TN counties in the top 20th national percentile. JSEC scores were highest in the Midwest, Central South and parts of New England. Overall, 90.6% of the top worst scoring counties on the JSEC index were in TN. Cluster analyses showed similar trends in the Midwest (p <= 0.05). Counties in 3 TN states (Kentucky, Tennessee, and Missouri) had greatest overlap in high JSEC and low SFIA scores. Areas with high JSEC and weaker neighboring SFIA policies were also concentrated in TN states (p <= 0.01). Results from PM data showed similar trends, but further presence of high JSEC and low SFIA scores in central TN states. **Conclusions:** US areas with high smoking prevalence and poorer environmental quality were concentrated in states with established tobacco-related disparities and fewer tobacco control policies. Due to potential additive or synergistic risks associated with environmental co-exposures, these areas may derive additional benefit from tobacco control policies beyond their impact on reducing tobacco use exposure.

FUNDING: Other

PS1-23

EXAMINING THE PUBLIC POLICY DEBATE OVER SOUTH AFRICA'S DRAFT TOBACCO CONTROL BILL

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Significance. In May 2018 the South African Minister of Health proposed new comprehensive tobacco control legislation (hereafter 'the Bill'). This study examines the public debate that ensued on the potential effects of the proposed policy. It explores how competing stakeholders framed their position and sought to dominate the information landscape. It will allow advocates to better understand industry policy interference strategies and identify effective ways of addressing them. **Methods.** We used the LexisNexis search engine to conduct a systematic search of South African news articles published between January 2018 and June 2019, which referred to the Bill. We monitored relevant hashtags and profiles on Twitter (March 2019 onwards) using DMI-TCAT and collected retrospective Twitter data (January 2018 - March 2019) manually. We conducted an inductive thematic content analysis of identified sources. Most frequently recurring themes were used to identify and categorise dominant frames in the debate. **Results.** The search yielded 130 media articles, 36 relevant Twitter profiles, and five key Twitter hashtags. The dominant framing was *economic* (e.g. growth of illicit trade, job losses, effect on state revenue, tobacco farming, burden of smoking on the health sector). Other frames were *health* (tobacco morbidity and mortality), *moralistic* (freedom of choice, unethical nature of tobacco industry), *historical* (success of previous legislation, post-colonial legacy, role of South Africa as continental leader), *international* (recommendations of international organisations, experiences of other countries, cultural context preventing effective enforcement). The economic frame was dominant and promoted by tobacco industry spokespersons, trade unions, organisations of retailers, media celebrities, think tanks - some of these have been identified as front groups or third-party lobbyists for the tobacco industry. **Conclusion.** Despite the voices of health advocates featuring prominently in media reporting, the policy debate on the Bill has been dominated by the economic frame.



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Consistent with earlier research, we found that the tobacco industry frames tobacco as an economic issue, which could risk marginalising public health interests and preventing, weakening, or delaying legislation.

FUNDING: Nonprofit grant funding entity

PS1-24

CLEAN INDOOR AIR LAWS, CIGARETTE EXCISE TAXES, AND USE OF SMOKING CESSATION TREATMENTS: A MEDIATION ANALYSIS

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Aim: Clean indoor air laws and cigarette excise taxes are consistently associated with population-level reductions in smoking. Yet, the mechanisms by which tobacco control policies promote smoking cessation are poorly understood. We examined whether the use of smoking cessation treatments mediates the association between clean indoor air laws and cigarette excise taxes, and smoking cessation. **Methods:** We used data on 62,165 adult participants in the 2003 and 2010/11 Current Population Survey-Tobacco Use Supplement who reported smoking cigarettes in the past year. Quitting in the past year was ascertained by the question: "Do you now smoke cigarettes every day, some days, or not at all?" Data on clean indoor air laws and cigarette excise taxes were obtained from the American Non-Smokers' Rights Foundation. Structural equation models were estimated to examine the mediating role of smoking cessation treatments (prescription medications, nicotine replacement therapy, counselling/support groups, quitlines, and internet resources) in the association of clean indoor air laws and cigarette excise taxes with smoking cessation. All analyses controlled for sociodemographics and included replicate weights to compute population-representative estimates. **Results:** Quitting smoking was associated with clean indoor air laws in 2003 and with excise taxes in 2010/11. The use of prescription medications, nicotine replacement therapy, and counselling/support groups explained one-third (32%) of the association between taxes and quitting. Although these smoking cessation treatments also mediated the association between clean indoor air laws and quitting, they explained a more modest degree (6%) of the association. **Conclusion:** While clean indoor air laws were significantly associated with the incidence of quitting in the early part of 21st century, excise taxes have recently gained a more prominent role. The influence of taxes is partly mediated through use of smoking cessation treatments, underscoring the importance of policies that make these treatments more widely available.

FUNDING: Federal

PS1-25

LOW DOSE NICOTINE DRIVES CHANGES IN RECEPTOR ASSEMBLY IN SPECIFIC BRAIN REGIONS

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Significance: Nicotine, the primary addictive compound in tobacco, binds with high affinity to neuronal nicotinic acetylcholine receptors (nAChRs). Chronic exposure to nicotine can cause changes in expression, trafficking and stoichiometry of nAChRs, leading to modification in their function. $\alpha 4\beta 2$ nAChRs, the predominant nAChR subtype in the CNS, have two distinct stoichiometries, $(\alpha 4)_3(\beta 2)_3$ and $(\alpha 4)_2(\beta 2)_2$. Nicotine-induced upregulation of $\alpha 4\beta 2$ nAChRs, especially changes in structural assembly, has been quantified in cell culture based systems using single molecule techniques. However, these methods are not capable of quantifying biomolecule assembly that takes place in a live animal. We conducted studies to determine the effect of low dose nicotine on the structural assembly of $\alpha 4\beta 2$ nAChRs taking place within an animal. **Methods:** We developed a single molecule technique to monitor the effect of nicotine on the distribution of $\alpha 4\beta 2$ nAChR stoichiometry in different mouse brain regions. The distribution of the two isoforms of $\alpha 4\beta 2$ receptors was quantified in the brain as a whole and individually in seven different brain regions from $\alpha 4$ -GFP knock-in mice. The mice were given low dose nicotine or saline through osmotic pumps for 12 days. Then nicotine administration was stopped to study the effect of nicotine after chronic exposure on one set of animals while another set of animals was allowed to go through nicotine withdrawal. **Results:** Nicotine alters the expression of $\alpha 4\beta 2$ nAChRs in the cortex and hippocampus, but not in the cerebellum, hypothalamus, midbrain, striatum, and thalamus. The stoichiometry of $\alpha 4\beta 2$ nAChRs in the cortex and hippocampus returns to the original population distribution after withdrawal. $\alpha 4\beta 2$ nAChRs isolated from the cerebellum, midbrain, and thalamus,

exhibit no significant changes in their distributions after nicotine withdrawal. **Conclusion:** Our brain region specific single molecule study revealed that nicotine acts differentially across brain regions to alter assembly of $\alpha 4\beta 2$ nAChRs to exposure and withdrawal.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS1-26

MODELING FLAVORED TOBACCO POLICY RESTRICTIONS: THE IMPACT ON PRODUCT AVAILABILITY IN THE RETAIL ENVIRONMENT

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Various US localities have restricted the sale of flavored tobacco products (FTPs), but their comprehensiveness varies, and many include exemptions for retailer types. This study examines the percent reduction in the number and density of tobacco retailers selling FTPs in every US county (n=3,233) resulting from three scenarios that would prohibit the sale of FTPs in all retailers except 1) alcohol outlets; 2) tobacco outlets; and 3) "adult-only" outlets (alcohol and tobacco outlets). We also estimated the potential of these policies to affect tobacco-related disparities by estimating FTP density per Blacks and Hispanics. FTP retailers (n=310,090) were estimated by 10 retailer codes in a national business directory (n=296,716) and a national vape shop directory (n=13,374). Density of FTPs was assessed using adaptive-bandwidth kernel density estimation to examine population-specific policy impacts. Exempting alcohol outlets would result in FTP availability at 28,815 (9.3%) retailers nationwide; a tobacco outlet exemption would leave 25,276 (8.2%) retailers; and an adult-only outlet exemption would leave 54,091 (17.4%) retailers. Compared to a comprehensive FTP ban, percent change in density per 1,000 population, on average, was 12.9% for an alcohol outlet exemption; 8.0% for a tobacco outlet exemption; and 19.1% for an adult-only outlet exemption. Racial/ethnic population impacts across counties on average mirrored total population density for each policy. However, this varied greatly for metro vs. nonmetro counties. For example, on average, the density per 1,000 blacks was 100% higher in metro counties than nonmetro counties given an alcohol outlet exemption. Overall, retailer exemptions allow for greater FTP availability compared with a comprehensive FTP policy. While each policy scenario, on average, had similar density reduction across racial/ethnic groups, FTP availability to racial/ethnic minorities remained higher than the total population in urban areas. Strong policies will have the greatest potential impact on reducing FTP availability. Importantly, strong policies will have more equitable reach and reduce FTP exposure among urban minority populations.

FUNDING: Other

PS1-27

COMPLIANCE WITH SMOKE-FREE POLICY IN QINGDAO CHINA

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Significance: In 2013, Qingdao enacted the "Qingdao Control of Smoking Regulations", which ban smoking inside all indoor public places and workplaces and require no-smoking signage be displayed at these venues. Given that little is known about the extent of compliance with smoke-free policies in smaller Chinese cities, the objective of this study was to assess compliance with the city's smoke-free policy and to identify venue types where smoke-free implementation needs to be strengthened. **Methods:** Observational data were collected by trained data collectors across five districts in Qingdao between October - November 2018. Observations pertaining to evidence of smoking (observed smoking, cigarette butts and ashtrays/similar instruments), and the presence, location and content of no-smoking signage, were conducted at different venues (N=791), using an observation form that had been uploaded to a mobile data collection application. Venues sampled included offices, restaurants, hotels, hospitals, and "other hospitality venues", which included bars/pubs, billiards rooms, clubs, comprehensive entertainment venues, game rooms, internet bars, and karaoke bars. Descriptive data analysis was conducted to understand level of compliance by venue type. **Results:** Evidence of smoking varied across venue types; 100% of children & maternity hospitals, 62% of restaurants, 61% of hotels, 38% of offices, and 19% of "other hospitality venues" were



compliant. Among these "other hospitality venues", compliance was highest at comprehensive entertainment venues (67%) and lowest at internet bars (5%) and clubs (0%). The display of no-smoking signs also varied by venue type. "Other hospitality venues" had poor compliance with no-smoking signage at the main entrance, particularly bars/pubs (0%) and game rooms (0%). The majority of no-smoking signs observed did not contain all of the components required by law. **Conclusion:** This assessment shows that enhanced efforts by enforcement agencies are needed to achieve the target of 100% smoke-free indoor public places and workplaces in Qingdao. Enforcement efforts should focus on venues with low compliance, such as "other hospitality venues".

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PS1-28

RAISING TAXES ON TOBACCO - LESSONS FROM THE PHILIPPINES AND UKRAINE

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Significance: Raising taxes on tobacco is one of the least adopted policy interventions. Given that it is also one of the most effective tobacco control measures, there is an urgent need to better understand the political dynamics that lead to its adoption. The primary aim of this study is to explore the process and determinants that led to the successful passage of the 2012 Sin Tax Reform Law in the Philippines and the 2017 Seven-Year Plan for tobacco tax increase in Ukraine. **Method:** We used a case study approach for each country. Data were gathered from key informant interviews (n=36) and documents (n=47). Cross-case analysis was subsequently employed to identify similarities and difference across the two cases. **Results:** We found that the political economy of the Philippines and Ukraine opened a window of opportunity for proponents of higher tobacco tax. In the Philippines, elections brought forth a new leader in 2010 who was keen to achieve universal health care and improve tax collection efficiency. In Ukraine, the European Union Association Agreement came into force in 2017 and included the Tobacco Products Directive requiring Ukraine to synchronize its excise taxes to that of the EU. The government also needed additional revenue. Leveraging these key entry points, proponents worked in partnership, involving supporters within the Ministries of Finance and Health, and framing the policy as a health and revenue generating measure. In both cases, experts trusted by the government used local data to counter industry arguments, address concerns and develop models to estimate the likely impact of tobacco tax increases. **Conclusions:** This cross-case analysis suggests the need for tobacco tax advocates to 1) develop a thorough understanding of the country's political economy in order to identify entry points and tailor their messages and tactics effectively; 2) work collaboratively, involving proponents from both the Ministries of Health and Finance; 3) frame the policy as a win for health and a win for revenue, 4) involve experts trusted by the government, and 5) use local data to enhance the credibility of the models and arguments.

FUNDING: Nonprofit grant funding entity

PS1-29

ASSESSMENT OF COMPLIANCE WITH KENYA'S SHISHA BAN IN SELECT PUBLIC PLACES, NAIROBI (MAY-JUNE, 2019)

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Significance: In 2017, the Government of Kenya implemented the *Public Health (Control of Shisha Smoking) Rules*, which prohibits the import, manufacture, sale, offer of sale, use, advertising, promotion, distribution, as well as facilitating or encouraging the use of shisha (waterpipe tobacco). Kenya is one of only six countries (Mauritius, Uganda, Niger, Rwanda and Ethiopia) in the WHO African Region that have adopted some type of ban against shisha. The goal of this study is to assess the compliance with this ban in bars, restaurants, and nightclubs in Nairobi County, Kenya. **Methods:** This is an observational study that employed a convenience sampling approach. Data collectors visited select areas with a high concentration of bars, restaurants and nightclubs during peak business days (Friday to Sunday) and hours (7pm to 2am). Data collectors surveyed a venue for up to 15 minutes or until shisha smoking was observed, and then completed a survey form on a mobile app. A venue was considered compliant with the law if no shisha smoking and shisha equipment were observed indoors and/or outdoors. We estimated the level of compliance by venue type and by county area. **Results:** Overall compliance with the law in the observed areas was 82% (n= 197). Compliance was highest in restaurants (95%, n=37), lower in bars (80%, n=115) and

lowest in nightclubs (76%, n=45). The areas in Nairobi County with the highest levels of compliance were Westlands (100%, n=36) and Kasarani (97%, n=37) and the lowest levels of compliance were found in Parklands (57%, n=35), Pipeline (65%, n=23), and Langata (76%, n=33). **Conclusions:** The results of this observational study indicate that the majority of shisha smoking occurs in nightclubs and bars, and in Parklands, Pipeline, and Langata. Based on these results, efforts to increase compliance and enforcement with the shisha ban should be directed at bars and nightclubs in these areas within Nairobi County.

FUNDING: Nonprofit grant funding entity

PS1-30

CHANGE IS IN THE AIR DEVELOPING A TOOL TO INCREASE ENGAGEMENT WITH SMOKE AND TOBACCO FREE COLLEGE POLICIES

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Significance: Adopting Smoke and Tobacco Free (STF) policies is a necessary first step to reducing the burden of tobacco use, exposure, and harmful environmental impact. Engaging the community around these policies is challenging; thus a new approach is needed to increase the likelihood of a successful STF policy. **Method:** Focus groups were conducted on two public California campuses (one UC and one CSU) to inform a tobacco waste/use online tracking tool and promotional campaign. Two groups were conducted at the UC campus: one with employees (N=6) and one with students (N=7). One group was conducted at the CSU campus with students (N=10). Domains of questions included content, name, functionality, and look of the tool and messaging for the promotional campaign. Content analyses based on recurring themes and summary statistics based on participant ranking were used. Videos and images were rated on how likely each would be to motivate reporting tobacco waste or use on campus (0, not at all likely to 10, extremely likely). **Results:** Recurring themes included the perception that policing and informing on other people should be avoided and greater motivation to use the tool after watching campaigns focused on environmental vs. health concerns. Both universities highly rated branding involving the word "air," reflecting an environmental focus. Other recurring themes were the desire for an integrated tool on an existing campus app for increased accessibility and a drawing system or an interactive game-like app with rewards. Further, realistic tobacco product images were favored over cartoon-like images and that both a location-enabled map and drop-down menu of locations were desirable. Barriers included lack of strong internet connection on campus, lack of knowledge about using a QR code, and lack of familiarity with smoking devices such as the vape pen and litter such as pods and marijuana packaging. **Conclusion:** Students and employees at two public California campuses steered the design of a new online tracking tool for tobacco use/waste and promotional campaign for the tool. Use of the tool is expected to increase engagement with college STF policies.

FUNDING: State

PS1-31

ENGAGEMENT AND READINESS TO SUPPORT COLLEGE SMOKE AND TOBACCO FREE POLICIES

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Significance: Adopting Smoke and Tobacco Free (STF) campus policies is a necessary first step to reducing the burden of tobacco use, exposure, and harmful environmental impact. Engaging the campus community is critical to the success of these policies. **Method:** An electronic survey was distributed to current students, faculty, and staff at a 100% smoke and tobacco free public California university in Fall 2018, one year following policy adoption. The survey assessed readiness to support the campus policy with five questions based on the Trans-Theoretical Model and engagement with the policy with a 9-item adaption of the ISA Engagement Scale containing Affective, Intellectual, and Social components. **Results:** The survey was completed by 3,566 (21% response rate; 81.9% students, 11.2% staff, 6.3% faculty, and less than 1% other). The majority of respondents (91.8%) correctly identified the campus policy as being 100% STF. A majority (76.4%) reported a preference for a 100% STF campus. Approximately half of the respondents (54.6%) reported seeing tobacco use on campus in the past 30 days. Engagement with the campus STF policy was 2.8 on a 7 point scale, with lower scores reflecting higher engagement. Approximately half of respondents were in the Pre-Contemplation stage (i.e., "never expect to") for readiness to support the campus STF policy (51.6% to 60.2% for individual items) while approximately 20% were in the Contemplation stage ("Might in the future;" 19.6% to 32.2% for individual



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items). **Conclusion:** Respondents at a public university with a 100% STF policy for one year displayed a high level of awareness of the policy and preference for the policy. However, half witnessed recent non-compliance. Engagement with the policy was moderate and readiness to support the policy was fairly low. Interventions are needed to increase engagement and readiness to support campus policies to inspire a social norm of policy compliance.

FUNDING: State

PS1-32

SURVEY OF STUDENTS, FACULTY, AND STAFF AT DUKE UNIVERSITY SUPPORTS IMPLEMENTATION OF A SMOKE-FREE CAMPUS POLICY

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Significance: There is currently a national trend for colleges and universities to adopt smoke-free campus policies such that today just over 50% of campuses report a smoke-free status. An important component in passing smoke-free policy is to determine whether this policy change aligns with desires of those who live and work within the campus community. **Methods:** To better understand our community's perception of this topic, we conducted a survey of students, faculty, and staff to assess rates of tobacco use and opinions regarding the potential implementation of a smoke-free campus policy at Duke University. **Results:** The survey was completed by 2826 students and 1021 faculty and staff. **Students:** Among the 2826 student respondents, 285 students (10.4%) reported cigarette use in the past 30 days, and 369 (13.5%) reported tobacco use of any kind within the past 7 days. Among students who used tobacco, 122 (33.1%) used more than one type of tobacco. Among student respondents, 68.95% supported a smoke-free campus policy. **Faculty and Staff:** Among 1021 faculty and staff respondents, 55 (5.4%) reported cigarette use in the past 30 days, and 68 (6.7%) reported tobacco use of any kind within the past 7 days. Among faculty and staff who used tobacco, 11 (16.2%) used more than one type of tobacco. Among all staff and faculty respondents, 833 (83.55%) supported a smoke-free campus policy. **All Respondents:** Support for a smoke-free campus was significantly higher among non-smokers compared to smokers ($p < .001$). Additionally, the perceived health risk of secondhand smoke was significantly higher among non-smokers compared to smokers ($p < .001$). **Conclusion:** Results of the survey demonstrated support for implementation of a smoke-free campus policy at Duke University. Survey results have been instrumental in the adoption of a smoke-free campus policy that will go into effect July 1, 2020.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS1-33

TOBACCO RETAIL PRICE POLICY SUPPORT AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF US ADULTS

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Increasing tobacco product price is associated with decreased consumption. Federal and local jurisdictions can enact policies in the US to increase tobacco prices or restrict use of industry coupons or multipack discounts. Limited research has examined public support regarding a range of policies impacting tobacco retail prices. Assessing public opinion on such policies can help stakeholders understand political feasibility of enacting these efforts. Data were from a nationally representative online panel of U.S. adults ($n=2,748$) collected Fall 2018. We measured level of support for five tobacco price policies: 1) preventing stores from accepting tobacco coupons; 2) preventing stores from offering multi-pack discounts; 3) adding an additional \$1 state cigarette tax; 4) adding a \$0.75 litter fee per pack of cigarettes; 5) requiring cigarette packs be sold at a standard minimum price. Weighted bivariate and multivariable adjusted logistic regression tested correlates of support. A majority of adults supported policies to prevent stores from accepting coupons (58.9%) or offering multi-pack discounts (58.9%). A greater proportion supported adding an additional \$1 state cigarette tax (67.5%), adding a \$0.75 litter fee (72.2%), and requiring cigarette packs be sold at standard minimum price (62.1%). In both bivariate and multivariate analyses, younger participants (18-24-years-old), women, Hispanics and those that identified as politically liberal reported higher rates of support for nearly all policies. In the bivariate analyses, support for all policies was lower among current cigarette, cigar, smokeless, and e-cigarette users versus never users, respectively (all p 's < 0.001). Adjusted regression analyses confirmed tobacco users had lower odds of support, except current cigar users had greater odds of support for \$1 tax (aOR=2.26 95%CI:1.15-4.44) compared to never

users. Findings suggest widespread public support to increase tobacco retail prices is high even among some current tobacco users and price sensitive populations, such as young adults. Results support public health advocates and inform policymakers looking to advance price-related tobacco control efforts.

FUNDING: Other

PS1-34

E-CIGARETTE-RELATED POLICY SUPPORT AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF US ADULTS

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The availability of e-cigarette flavors and limited presence of e-cigarette indoor air laws can perpetuate and normalize e-cigarette use, especially among youth and young adults. Research on public support for policies to restrict sales and indoor use of e-cigarettes is limited, particularly given the recent growth of e-cigarette use in the US. We assessed support for five e-cigarette policies: 1) banning flavored e-cigarette sales; 2) keeping tobacco products, like e-cigarettes, out of view in stores youth can enter; and prohibiting e-cigarette use in 3) all indoor public places 4) restaurants and 5) bars. Data were collected Fall 2018 from a nationally representative online panel of U.S. adults ($n=3,211$). Weighted, adjusted logistic regressions modeled variation in policy support by demographics, tobacco use behavior, e-cigarette harm perceptions, and state-level clean air policies. Most adults supported keeping tobacco products out of view (78.0%) and prohibiting e-cigarette use in indoor public places (82.9%), restaurants (86.5%), and bars (76.1%). A lower majority (63.3%) supported a flavor ban. In adjusted models, older adults (>24 years-old) and those with less than a college education had significantly lower odds of support for all indoor air policies. African Americans had lower odds of support for a flavor ban (aOR=0.71, 95%CI:0.51-0.98). Current cigarette or e-cigarette users had lower odds of support for nearly all policies; however, we saw no difference in flavor ban support by smoking status. Greater e-cigarette harm perceptions were associated with increased odds of support for all policies (aOR range: 1.1-1.4, all p 's ≤ 0.002). Comprehensiveness of state clear air policy was not significantly associated with policy support. Results suggest high levels of public support to regulate e-cigarettes, regardless of existing state policies. Targeted messaging may be needed to increase support among marginalized groups (e.g. African Americans, low-SES individuals), older adults and tobacco users. Our findings can inform policymakers to advance regulatory efforts that reduce exposure to e-cigarettes among young people and other vulnerable populations.

FUNDING: Other

PS1-35

THE TOBACCO RETAIL ENVIRONMENT IN COLUMBUS, OHIO, BEFORE AND AFTER TOBACCO 21

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SIGNIFICANCE. To date, over 475 localities have implemented a Tobacco 21 (T21) policy in the United States. Columbus, Ohio, began enforcement of a T21 ordinance in September 2017. The current study evaluated whether the tobacco retail environment in Columbus changed after T21 implementation with respect to trajectories of 1) cigarette prices, 2) availability of flavored tobacco products, 3) exterior advertisements for tobacco products, and 4) price promotions for tobacco products. **METHODS.** A stratified random sample of Columbus retailers holding a cigarette dealer license was audited from 2014 to 2019 ($N=74$ to 103 retailers per year). Fieldworkers completed audits in pairs during daylight in late spring and summer months. Mixed effects regression models evaluated whether time trends in prices of Marlboro Reds, Newport Menthols, or the cheapest cigarettes; availability of flavored tobacco products; exterior advertisements; and interior and exterior price promotions changed post-T21 implementation. All models controlled for store type and census tract poverty level, race, and percent youth. **RESULTS.** Implementation of T21 was associated with a change in the trajectory of the price of Marlboro Reds (per-year price increase of \$0.25 pre-T21 vs. \$0.08 post-T21; $p=0.008$). Similarly, the per-year change in count of price-promoted tobacco products changed post-T21 (21% decrease per year pre-T21 vs. 29% increase per year post-T21; $p=0.004$). No statistically significant changes in the trends of flavored product availability or exterior advertisements were observed. **CONCLUSION.** Implementation of T21 was associated with changes in the trajectories of cigarette prices and price promotions. In both cases, the change in trajectory resulted in tobacco products being available at lower prices



than they would have been if the pre-T21 trajectory had continued. Results underscore the need for continued surveillance of the tobacco retail environment before and after localities or states implement T21 policies. **FUNDING.** This study was funded by the National Cancer Institute and the Food and Drug Administration Center for Tobacco Products (P50CA180908).

FUNDING: Federal

PS1-36

NICOTINE METABOLISM GENETICS IN C57BL/6J AND NOD/SHILtJ MOUSE STRAINS

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Variability in nicotine metabolism gene sequence and expression can influence nicotine addiction susceptibility. This genetic variability can be modeled in rodent systems. Mice metabolize nicotine similarly to humans and are therefore an ideal model system to use for these studies. Preliminary data suggest that there are differences in nicotine metabolism between two inbred mouse strains, C57BL/6J and NOD/SHILtJ. To identify possible genetic factors mediating this difference, genetic variants in 24 nicotine metabolism genes were compared using the Sanger Institute Mouse Genomes Project database. Non-synonymous polymorphisms were found in 3 of the 24 examined gene sequences: *Cyp2f2*, *Aox1*, and *Cyp3a44*. *Cyp2a5*, *Cyp2a4*, and *Aox1* expression levels were measured by qPCR in liver tissue from both strains. NOD/SHILtJ mice showed reduced liver expression of *Cyp2a5* and *Cyp2a4*, genes that are primarily responsible for nicotine metabolism in mice. NOD/SHILtJ mice had increased expression of *Aox1*, another nicotine metabolism-related gene. These data demonstrate differences in nicotine metabolism between two mouse strains. This sets a foundation for future studies to explore the influence of genetic variants differentiating C57BL/6J and NOD/SHILtJ mice on addiction-relevant behaviors.

FUNDING: Federal

PS1-37

DEVELOPMENT OF A NICOTINE AEROSOL SELF-ADMINISTRATION MODEL IN RODENTS AND THE IMPACT OF E-LIQUID FLAVORS

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Significance: There are currently no established preclinical models of aerosol nicotine self-administration (ANSA). ANSA is more comparable to human electronic nicotine delivery systems (ENDS) use than i.v. nicotine self-administration (IVNSA). ANSA can also be used to examine the role of flavors in ENDS product abuse liability. **Methods & Results:** In Experiment 1, mice and rats were trained to respond for sucrose, or exposed to priming infusions of nicotine aerosol. Sucrose training led to greater responding for aerosol than priming infusions of aerosol. Rodents trained to respond for sucrose on two manipulanda exhibited greater responding on the inactive manipulandum not associated with aerosol, but those trained to respond on only one manipulandum exhibited greater responding on the active manipulandum associated with aerosol delivery. Most rodents responded more for aerosol on Day 1 than any other day. Nicotine concentration had little effect on responding, and responding was similar for vehicle and nicotine. The addition of raspberry flavor to the e-liquid increased responding relative to nicotine alone, and responding for flavored vehicle increased with corresponding increases in flavor concentration. Number of nicotine infusions earned for all ANSA groups was well below that typically observed for IVNSA rodents. In Experiment 2, rats were trained to respond for sucrose with or without a popular ENDS flavor (raspberry). Preliminary results show that responding for sucrose was similar for flavor and no flavor groups. Subsequently, these rats will be exposed to aerosolized nicotine, with or without flavor, for self-administration. Comparison of these conditions will model a policy change to regulate flavors in e-liquids. Several concentrations of nicotine aerosol will be examined. **Conclusions:** Although development of a complete preclinical model of ANSA is still in progress, initial results indicate that sucrose training and the use of flavors may facilitate ANSA. Further, the finding that aerosolized flavors enhance responding suggests that recent policies to regulate flavors in e-liquids are prudent. Future research is needed to determine if there are conditions under which ANSA responding is comparable to IVNSA.

FUNDING: Federal; Nonprofit grant funding entity

PS1-38

FLAVOR CAPSULE CIGARETTES, ELECTRONIC CIGARETTES, AND HEAT NOT BURN PRODUCTS POINT OF SALE ADVERTISING IN GUATEMALA.

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Significance: The point-of-sale (POS) in an important marketing channel for the tobacco industry to communicate with current, former and potential smokers. Even though Guatemala ratified the Framework Convention on Tobacco Control, it has not yet implemented a ban on POS advertising. Given the widespread availability of capsule cigarettes, electronic cigarettes (ecigs) and heat-not-burn (HnB) products, we sought to estimate the prevalence of POS advertising in the two major cities in Guatemala. **Methods:** Convenience stores were randomly surveyed in middle- and high-socioeconomic status (SES) neighborhoods in Guatemala City (n=60) and Quetzaltenango (n=15). We adapted a previously implemented checklist to assess the availability of exterior and interior advertising for cigarettes (including capsule), ecigs, and HnB (IQOS and HEETS). Data entry was done in Kobo Toolbox and analysis in STATA. Results were compared to previous (2008) findings. Results: All POS sold conventional and flavor capsule cigarettes, 78% ecigs and 68% HnB. Ecigs were available in a wide range of flavors. All stores that sold IQOS had flavored HEETS (amber, bronze, turquoise, yellow, blue, and purple). Ecigs were more likely to be found in the City (96%) than in Quetzaltenango (13%). HnB were only found in the City (85%). Median number of ads for cigarettes and capsule cigarettes was significantly higher in the high (4.5 and 2, respectively)- compared to the middle-SES (1 and 1) neighborhood and Quetzaltenango (2 and 2). Most cigarette advertising was for capsule cigarettes (Pall Mall). Most ecigs (83%) and HnB (74%) were found <20" from confectionery. Nearly all stores in the City and 33% in Quetzaltenango had other forms of cigarette advertising (tables and stickers). No POS advertising for capsule cigarettes, ecigs and HnB products were found in 2008. Fewer POS displayed the mandatory age restriction sign in 2019 (4%). **Conclusion:** We found a high prevalence of POS advertising for flavor capsule cigarettes and availability of ecigs and HnB products at the POS. Our findings highlight the POS as a channel the industry uses to communicate with current, former and potential customers.

FUNDING: Academic Institution

PS1-39

FEMALE SMOKERS' PERCEIVED EFFECTIVENESS OF GAIN- AND LOSS-FRAMED PREGNANCY-RELATED HEALTH WARNING MESSAGES

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Significance: Women smoke less than men, have equal interests in quitting, but there is evidence that women have a more difficult time sustaining cessation compared to men. Current health communications, including health warning labels and media campaigns focus, on negative consequences of continued smoking (loss-framing); emerging research suggests positive messages (gain-framing) may be more effective with certain subpopulations, including female smokers. The mandatory Food and Drug Administration (FDA) warning related to pregnancy yields an opportunity to study health warning messages (HWMs) salient to women to examine differences in perceived effectiveness by message framing. **Methods:** A convenience sample of female smokers (n=135) of reproductive age (18-44 years) were recruited in a medical clinic. Participants rated 10 analogous gain-framed and loss-framed HWMs for perceived effectiveness; the sample was balanced between pregnant and non-pregnant women. Participants also reported their perceived risks of smoking during pregnancy, quit intentions in the next month, and cessation self-efficacy. Statistical analysis used logistic and linear regression analyses to examine whether gain framing was associated with higher perceived effectiveness of HWMs. **Results:** Participants rated the gain-framed HWMs as more effective than loss-framed messages (p<0.01). Pregnancy status was not significantly associated with differences in message perceptions. Those endorsing higher perceived risks of smoking during pregnancy rated both gain-framed and loss-framed HWMs as more effective compared to women with lowered risk perceptions. Additionally, quit intent and cessation self-efficacy were significantly, positively associated with increased HWM effectiveness. **Conclusions:** In this study, women of reproductive age supported gain-



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framed over loss-framed messages as more effective cigarette HWMs. Gain-framed HWMs warrants further investigation into the potential to reach this vulnerable population and promote smoking cessation.

FUNDING: Other

PS1-40

ADDRESSING THE NEEDS OF OLDER SMOKERS IN RESEARCH, TREATMENT, AND POLICY

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The number of adults 65 years and over is projected to nearly double worldwide between 2012 and 2050, and for the first time in recorded history, the number of older adults will outnumber children. Of concern for the field of nicotine and tobacco research is the parallel observation that smoking rates in the United States have declined considerably for all age groups except for smokers 65 and older. In fact, according to NHIS estimates, smoking prevalence rates for aging smokers have not changed considerably for nearly two decades (ranging from 8-12% between 1997 to 2017). Thus, even if smoking prevalence rates remain the same for this age group, it could be the case that the absolute number of aging smokers will increase. This reality is particularly troubling given that older smokers carry a disproportionate burden of health effects of smoking and accrue nearly 12 times more smoking-attributable healthcare expenses compared to younger smokers. For these reasons, a narrative review was prepared to address three key topics as they relate to aging smokers: quit attempts and smoking cessation, harm perception, and treatment responsiveness. Findings from the review reveal that older smokers are less interested in quitting, make fewer quit attempts, and are less likely to successfully stop smoking compared to younger smokers. In addition, older smokers have more misconceptions about the harms of smoking and are sometimes less responsive to evidence-based smoking interventions including medications, taxation, warning labels, and anti-smoking messages. These findings have important implications for clinical practice and tobacco control policy. Actionable strategies for better supporting older smokers in their efforts to stop smoking will be presented, as will recommendations for the development of novel, age-tailored smoking interventions. Overall, this review aims to prompt discussion around the unique needs of older smokers as they relate to tobacco-related research, treatment, and policy.

FUNDING: Federal; Pharmaceutical Industry

PS1-41

GENDER DIFFERENCES IN NICOTINE VAPING PRODUCT USAGE, FINDINGS FROM THE 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: Little is known about gender differences in use of nicotine vaping product (NVPs). This study examines gender differences in: (1) reasons for vaping, (2) characteristics of vaping devices used, and (3) the use of NVPs on quit attempts. **Methods:** Data came from the 2018 International Tobacco Control 4 Country Smoking and Vaping (Canada, United States, England, Australia) Survey. For objectives (1) and (2), analysis was restricted to 3,938 NVP users who reported currently using NVP on a daily or weekly basis; (3) analyses were restricted to 5,537 smokers who reported having at least one quit attempt. Chi-squared tests, and logistic regression were used. Regression models were adjusted for age, country, pattern of use, socioeconomic status, and smoking urges. **Results:** Among 3,938 NVP users, 54% were male. The most commonly cited reasons for NVP use in females were 'less harmful to others' (85.8%) and in males were 'less harmful than cigarettes' (85.5%). Females were more likely than males to cite 'less harmful to others' (adjusted odd ratio(aOR)=1.66, p<0.001) and 'help cut down on cigarette' (aOR=1.60, p=0.001) as reasons for use. Significant gender differences were found in NVP device characteristics with males being more likely than females to report using box-shaped tanks devices (p=.043), and also more likely than females to report using e-liquids containing >20mg/ml of nicotine and tank devices with >2ml capacity(aOR=2.43, p<0.001 and aOR=1.55, p=0.026, respectively). There was no gender difference in use of flavoured e-liquids, with fruit as the most common flavour for males (54.5%) and females (50.2%). There was no gender differences in using NVP on quit attempts in smokers who had made a quit attempt within 18 months

before survey completion (N=5,537, p>0.05), with 32.9% of male and 30.4% of female reporting using an e-cigarette at last quit attempt. **Conclusion:** There were some gender differences in reasons for vaping and characteristics of the device used in NVP users. Regular monitoring of gender differences in pattern of NVP use could be considered. **Funding:** This study was supported by grants from the US National Cancer Institute P01CA200512, the Canadian Institutes of Health Research (FDN - 148477), and by the National Health and Medical Research Council of Australia (APP1106451). GTF was supported in part from a Senior Investigator Award from the Ontario Institute for Cancer Research.

FUNDING: Academic Institution

PS1-42

CORTICOTROPIN-RELEASING FACTOR RECEPTOR 1 (CRFR1) NEURONS IN MOUSE VENTRAL TEGMENTAL AREA AND NICOTINE-INDUCED CHANGES IN INHIBITORY SIGNALING

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SIGNIFICANCE: Addiction is a complex disorder often thought to involve the disruption of the reward circuitry in the brain. One of the main reward-encoding components of this circuitry is the ventral tegmental area (VTA) and its dopaminergic projections to the nucleus accumbens (NAc). However, the VTA contains heterogeneous populations that can express different neurotransmitters and receptors, one of which is the corticotropin-releasing factor receptor 1 (CRFR1). This receptor is activated by corticotropin-releasing factor, the neuropeptide that is released in response to stress. Extensive work has previously examined the effects of nicotine on VTA dopamine neurons, however, much less is known about the actions of nicotine on VTA CRFR1 neurons. In this study, we aim to characterize the VTA CRFR1 neuron population and examine its inhibitory signaling in response to nicotine. **METHODS:** To target the CRFR1 neuron population, we use transgenic mice (CRFR1-GFP) that express GFP under the CRFR1 promoter. We performed immunohistochemistry (IHC) using the tyrosine hydroxylase (TH) antibody to label dopaminergic neurons and quantified the number of neurons that express CRFR1, TH, or both. We further examine the inhibitory signaling of VTA CRFR1 neurons that project to the NAc using red Retrobeads and slice electrophysiology to measure the cell membrane properties and spontaneous inhibitory postsynaptic currents (IPSCs) in response to slice application of 1uM nicotine. **RESULTS:** We found that approximately 40% of all VTA dopamine neurons express CRFR1 and approximately 80% of all VTA CRFR1 neurons are dopaminergic. In response to slice application of nicotine (1uM) onto CRFR1 VTA neurons that project to the NAc, we found a slight decrease in the sIPSC frequency and no change in sIPSC amplitude. **CONCLUSIONS:** Although most (~80%) of the VTA CRFR1 neurons are dopaminergic, we found a slight decrease in sIPSC frequency in response to nicotine in CRFR1 neurons. This differs from previously shown transient increases in sIPSC frequency and amplitude in VTA DA neurons in response to nicotine, which suggests that VTA neurons that express CRFR1 may respond differently to nicotine.

FUNDING: Federal

PS1-43

THE PLUMMETING PRICE OF NICOTINE ADDICTION

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Design: To compare the price of Marlboro cigarettes and concentrated salt nicotine e-cigarettes (≥50mg/ml) based upon their ability to achieve equivalent levels of plasma nicotine. **Methods:** Prices of salt nicotine e-cigarettes including JUUL and JUUL compatible pods, other small pod devices, disposable e-cigarettes, 30ml e-liquid bottles, and wholesale bulk nicotine were compared to combustible cigarettes in relation to both their nicotine content and nicotine absorption by the consumer. Pharmacodynamic absorption studies have shown that salt nicotine aerosol is approximately 4 to 5 times more efficient at nicotine delivery than combustible cigarettes. The relative price of achieving plasma nicotine concentration equivalent to a pack of cigarettes for each e-cigarette product was estimated. **Results:** Survey found the average price of Marlboro in the US is \$8.00 per pack equaling \$2920 per annum for a pack per day (PPD) habit. Per Marlboro pack equivalent, price of disposables e-cigarettes \$4.79 (60%), JUUL \$4.00 (50%), small pod e-cigarette devices \$3.11 (39%), JUUL compatible pods average \$2.28 (28%), and 30ml e-liquid bottles \$0.46 (6%). **Conclusions:** High nicotine e-cigarettes have dramatically reduced the cost of addictive levels of nicotine. This encourages use among price-sensitive populations such as youth, minorities, and the poor. **Policy Implications:** Current



e-cigarette taxes, levied in only 10 of 50 US states, tax low and high nicotine products equally. With the rapidly rising popularity of high nicotine products, serious consideration should be given to taxing nicotine content on a sliding scale based upon concentration.

FUNDING: Unfunded

PS1-44

RAPID GROWTH OF JUUL HASHTAGS AFTER THE COMPANY CEASED SOCIAL MEDIA PROMOTION

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Background: The e-cigarette brand JUUL halted its promotional social media postings on November 13, 2018 as part of its "commitment to youth prevention." **Objective:** To examine the popularity of hashtags containing the JUUL trademark (eg. #juul) before and after the company ended its social media marketing. **Methods:** Post counts of Instagram hashtags containing the JUUL brand name were sampled periodically before and after JUUL ended its social media promotions. A sample of 1000 social media posts were analyzed to determine the fraction depicting either JUUL products or their competitors. Keyhole® was used to determine the engagement of #juul posts across social media networks. **Results:** Over the 3 years and 5 months between the introduction of #juul simultaneous to JUUL's launch party (June 4, 2015) and the company's ceasing of social media marketing (November 13, 2018) over a quarter of a million posts appeared. In the 7 months since the company halted its promotional postings, the rate of community posting accelerated markedly resulting in the number of posts doubling to over half a million. Social media engagement (via Keyhole®) was 55x greater than the post count. Among #juul posts, 15.4% showed JUUL products, 28.1% JUUL competitors, and 3.7% products from both JUUL and its competitors. Reflecting the popularity of #juul as a gathering place for its largely youthful audience, non-vaping related posts made up the remaining 52.8%. **Policy Implications:** As social media has been a potent accelerant of youthful interest in JUUL, shutting down heavily trafficked loci is a priority. There are two potential pathways to end hashtag-based promotion of JUUL. An action could be initiated by Instagram based upon mitigating community harm or by JUUL based upon infringement of their trademark.

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PS1-45

COMPLIANCE WITH POINT-OF-SALE TOBACCO CONTROL POLICIES IN DEPOK, INDONESIA

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Introduction: In 2014 the city of Depok, Indonesia, enacted "Local Government Regulation Number 3", which banned tobacco product advertising and promotion at the point-of-sale (POS). In 2018, the city passed additional regulations banning tobacco product display. This study assessed compliance with POS tobacco control policies in Depok. **Method:** Trained data collectors conducted observations in tobacco POS during February and March 2019. Observations assessed 1) the presence of tobacco advertisements inside and outside venues, 2) tobacco product promotions, and 3) tobacco product displays. The sample included all supermarkets in the city, and a random sample of convenience stores and independent small grocers. **Results:** Observations were conducted in 400 venues including supermarkets (n=8), convenience stores (n=192), and independent small grocers (n=200). Tobacco advertising was visible on the outside of venues at 13% of supermarkets, 17% of convenience stores, and 81% of independent grocers. Indoor tobacco advertising was observed in 13% of supermarkets, 11% of convenience stores, and 79% of independent grocery stores. Advertisements included posters, and illuminated and 3-dimensional displays. Tobacco promotions were observed in independent grocery stores and included free gifts with purchase (n=2) and a price discount (n=1). Tobacco products were covered by a curtain or cupboard in most (75%) supermarkets, 18% of convenience stores, and 5% of independent small grocers. In convenience stores one third (32%) of tobacco displays were openly visible while one half (50%) were partially covered by a curtain. In independent small grocers, nearly all (95%) tobacco product displays were not covered. **Conclusion:** The implementation of POS restrictions has been implemented partially in supermarket and

convenience stores, although there is opportunity for improvement. POS advertising & product display is common in independent small grocers where significant improvements could be made on the implementation of POS regulations. Tobacco product promotions were not common across the sample. Improved implementation with POS restrictions will support broad tobacco control goals.

FUNDING: Nonprofit grant funding entity

PS1-46

FOOTSHOCK STRESS AND NICOTINE EXPOSURE IN ADOLESCENCE POTENTIATES ADULT NICOTINE SELF-ADMINISTRATION IN MALE SPRAGUE-DAWLEY RATS

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While cigarette smoking is decreasing, there is a dramatic increase in nicotine use via e-cigarettes, particularly in adolescence. Adolescent e-cigarette users have a greater prevalence of future cigarette smoking, and those who may have otherwise never tried cigarettes have a greater chance of initiating cigarette smoking if they begin e-cigarette use in adolescence. In humans and rodents, early initiation of nicotine has been associated with greater consumption, dependency, and persistence of nicotine use. Stress and anxiety reduction is highlighted as a main reason to continue smoking, and stress and anxiety levels are elevated in smokers, although the causal direction of this relationship is still unclear. The current study sought to assess the interaction between adolescent nicotine and stress exposure on adult nicotine self-administration. **Methods:** Adolescent male Sprague-Dawley rats were randomly assigned to one of five groups: CS+ or CS- (Nicotine-Shock); Shock (no nicotine); Nicotine (no Shock); Saline (no Nicotine/Shock). During adolescence (PND 28-56), rats received alternating sessions of 1.0 mg/kg nicotine or 1 ml/kg saline SC, 5 min before onset of a 20 min session in an operant box either paired (CS+), unpaired (CS-), or never experienced (Nicotine) with 8 random presentations of shock (0.8mA; 0.5-sec). Opposite stimuli were presented on alternating sessions depending on group assignment; Saline rats never received nicotine or shock. Following adolescent conditioning, rats were surgically implanted with jugular catheters (PND 63) and allowed to lever-press for 0.03 mg/kg/infusion IV nicotine in adulthood (PND 70). **Results:** Intermittent exposure to a high dose of nicotine or footshock stress alone during adolescence was unable to significantly affect adult nicotine self-administration relative to saline controls, while chronic alternating nicotine and footshock stress in adolescence potentiated nicotine self-administration in adulthood. **Conclusions:** Chronic stress, in the form of alternating nicotine and shock exposure in adolescence, rather than intermittent nicotine or shock alone, increases susceptibility of increased future nicotine intake in adulthood.

FUNDING: Federal; Academic Institution

PS1-47

SOURCES OF INFORMATION, PERCEPTIONS, AND USE OF JUUL E-CIGARETTES AMONG ADULT CIGARETTE SMOKERS

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Introduction: Given JUUL e-cigarettes' potential for smoking cessation and its drastically increased sales in the U.S., more evidence is needed to understand the correlates of JUUL use among adult cigarette smokers. This study assessed the relationships between sources of information and perceptions about JUUL and the behavior of using JUUL among current smokers. **Methods:** We conducted an online study with adult cigarette smokers in 2019. Among those who were aware of JUUL e-cigarettes (n=341), we asked respondents about information sources where they learned about JUUL, perceptions of using JUUL versus Vuse (a competing e-cigarette brand), and ever and current (past-30-day) JUUL use. We used multivariable logistic regressions to examine the associations between information sources, JUUL-related perceptions compared to Vuse, and JUUL use, adjusting for respondents' socio-demographic backgrounds and tobacco use history. **Results:** Learning about JUUL through internet ads (online banners and social media) was associated with many positive perceptions about JUUL compared to Vuse, including that JUUL is more fun to use (AOR=2.04, 95% CI=1.21, 3.42) and tastier (AOR=1.96, 95% CI=1.19, 3.22). Perceiving JUUL as being tastier (AOR=2.07, 95% CI=1.23, 3.49), more helpful for quitting smoking (AOR=2.07, 95%



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CI=1.22, 3.53), and cooler (AOR=2.07, 95% CI=1.21, 3.56) than Vuse was associated with ever using JUUL. Only the perception that JUUL is tastier than Vuse (AOR=1.98, 95% CI=1.10, 3.59) was associated with current use of JUUL. **Discussion:** This study found that similar to youth who are naïve to tobacco products, adult cigarette smokers also focus on the positive sensory, social, and recreational experience of using JUUL. These positive perceptions are likely to be influenced by internet ads as well as are more likely to sustain JUUL use than the perception of smoking cessation benefits from using JUUL. Regulating JUUL's internet marketing to minimize its appeals among youth may have unintended consequences of diminishing the positive perceptions and use of JUUL among adult smokers.

FUNDING: Federal

PS1-48

ABUSE LIABILITY FOR FLAVORED CIGARS AMONG YOUNG ADULT COMBUSTIBLE TOBACCO CIGARETTE SMOKERS

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Significance: Flavors facilitate tobacco product uptake and may appeal to youth. To inform potential federal regulations on characterizing flavors in cigars, we investigated flavored cigars' abuse liability among young adult cigarette smokers using behavioral economic measures. **Methods:** In a clinical laboratory experiment, n=25 cigar-naïve young adult smokers (ages 18-25) attended 5 Latin square-ordered laboratory visits including two 10-puff bouts of own-brand cigarettes or apple-, wine-, cream-, or original-flavored Black & Mild cigars. In 3 abuse liability tasks, participants made choices regarding tobacco products at several prices (\$0-\$10.24 per 10 puffs). The multiple choice procedure produced the crossover point (first price at which participants chose money over tobacco products). Using the cigarette/cigar purchase task, we measured intensity (consumption at \$0), breakpoint (price at which consumption reaches zero), Omax (maximum expenditure), Pmax (price at Omax), and elasticity (rate at which consumption changes as prices increase). The cross-product purchase task yielded cross-product elasticity, which measures how consumption of cigars changes as cigarette prices increase. Outcomes were analyzed with linear mixed models. **Results:** The original-flavor cigar had a significantly higher crossover point than apple- or wine-flavor cigars ($p < 0.05$). Cigarettes were associated with higher intensity, breakpoint, and Omax values than any cigar flavor ($p < 0.05$). Cigarettes had higher Pmax values than apple- or wine-flavor cigars ($p < 0.05$) and lower elasticity values than apple cigars, indicating higher abuse liability. In the cross-product purchase task, cigar consumption increased as cigarette prices increased, $p < 0.001$. **Conclusions:** Flavored cigars scored lower than cigarettes on several abuse liability indices, but may function as economic substitutes for cigarettes. Further, abuse liability may vary by cigar flavor, with cream and original flavors appearing more appealing than apple or wine cigars. Regulators may consider restricting characterizing flavors in cigars, particularly those flavors with the greatest abuse liability.

FUNDING: Federal

PS1-49

THE ACTUAL AND ANTICIPATED EFFECTS OF MENTHOL CIGARETTE BANS: A SYSTEMATIC REVIEW

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Background: The FDA, under the 2009 Family Smoking Prevention and Tobacco Control Act, banned characterizing flavors in cigarettes citing their appeal to youth and young adults. Notably, this ban exempted mentholated tobacco products. Since 2009, over 20 US localities have extended this restriction to include menthol cigarettes. Currently, the FDA is reconsidering its position on a nation-wide menthol ban. The effects of such a ban remain unclear. We conducted a systematic review to explore the actual or potential impacts of a menthol cigarette ban on cigarette sales, and population and industry's behavior. **Methods:** We conducted our review using PubMed (to June 5, 2019). We retrieved articles directly relevant to the effects of an implemented or hypothetical ban on menthol tobacco products, as well as articles that considered bans on flavored tobacco products due to their relevance in understanding the effects of ban compliance and product substitutability. **Results:** The search identified 101 articles, of which 25 were included. Studies examining the individual (n=19) and industry (n=6) effects of a menthol ban were primarily survey-based cross-sectional or longitudinal studies. Seven studies assessed the effects

of an implemented menthol ban, and eight examined a hypothetical menthol ban. Ten studies examined non-menthol flavor bans. Overall, studies found that actual menthol bans reduced sales and increased smoking cessation with only partial substitution by non-menthol cigarettes. Smokers' responses to a hypothetical ban showed that around 25% would quit smoking and approximately 15% would consider switching to other tobacco products, including e-cigarette in light of a ban. Menthol ban compliance was high in Canadian provinces, but studies of US flavor bans indicate that the tobacco industry and retailers would attempt to flout the ban by taking advantage of loopholes. **Conclusion:** Much is still unknown about the effects of a menthol ban, but current research indicates a menthol ban as would promote smoking cessation and reduce initiation. The results are consistent with studies examining current menthol use and smoking initiation and cessation.

FUNDING: Federal

PS1-50

A BEHAVIORAL ECONOMICS ANALYSIS OF SEX DIFFERENCES IN NICOTINE SELF-ADMINISTRATION IN RATS

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Significance: The US Food and Drug Administration has been authorized to reduce nicotine levels in tobacco, and therefore research into the relationship between nicotine dose, price, and intake is essential. Animal studies can inform policy regarding nicotine levels in tobacco products and e-cigarette solutions. Increasing the price of nicotine-containing products decreases their use, but it is unknown how the relationship between price and consumption is affected by both sex and nicotine dose. **Methods:** A behavioral economics procedure was used to determine the demand elasticity for nicotine in male and female rats. Demand elasticity describes the relationship between price and consumption. A high level of elasticity indicates that consumption is relatively sensitive to increases in price. The rats self-administered a low dose (0.01 mg/kg/inf) or a standard dose (0.03 mg/kg/inf) of nicotine for 9 days under a fixed-ratio (FR) 1 schedule. Then the price (FR schedule) of nicotine was increased, and a demand analysis was conducted. A similar study was conducted with palatable food pellets. **Results:** There were no sex differences in nicotine or food intake under the FR1 schedule. However, demand for 0.03 mg/kg/inf of nicotine was more elastic in females than males. Demand for 0.01 mg/kg/inf of nicotine and food was more elastic in males than females. **Conclusions:** These findings indicate that there are no differences in nicotine and food intake between males and females when the price is low. When the price of nicotine or food is increased, males maintain their old level of intake longer than females when they have access to a standard dose of nicotine, and females maintain their intake longer when they have access to a low dose of nicotine or food. This has implications for tobacco regulatory policy. In a regulatory environment where only low nicotine-containing products are allowed, increasing the price of nicotine products may lead to a greater decrease in nicotine use in males than females.

FUNDING: Federal

PS1-51

IMPACT OF LOCAL FLAVORED TOBACCO SALES RESTRICTIONS ON POLICY-RELATED ATTITUDES AND PERCEIVED ACCESS AMONG CALIFORNIA RESIDENTS

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BACKGROUND. More than 36 California (CA) jurisdictions restrict sales of flavored tobacco, with some including menthol. We sought to evaluate the impact of local ordinances on policy support and perceived access to flavored tobacco. **METHODS.** In January-March 2019, we conducted an online survey of 3075 CA youth (15-17 years, n=517), young adults (18-20 years, n=1038), and adults (21-29 years, n=1520) who were recruited through social media. Half of respondents lived in a jurisdiction that restricts flavored tobacco sales (Policy group, n=1539), and half lived in the rest of the state (ROS group, n=1536). With an emphasis on sampling flavored tobacco users and African Americans (AA), respondents were 7.7% AA (Hispanic and Non-Hispanic (NH)), 28.1% Hispanic (Non-AA), 28.7% NH-Asian, 27.5% NH-white, 5.7% NH-other/multiracial, 23.6% LGBTQ, and 35.4% flavored tobacco users. Multivariable models with covariates for respondent- and community-level characteristics assessed group and subgroup differences on propensity score-weighted outcomes: policy support (agree/strongly agree) and perceived access (hard/very hard to buy products in the town where



I live). RESULTS. Policy and ROS respondents reported equivalent support for flavored tobacco restrictions. For example, more than half (68.2% Policy, 68.9% ROS) agreed that eliminating the sale of flavored tobacco will help prevent youth from using tobacco. Contrary to expectation, Policy respondents were less likely than ROS respondents to report perceived difficulty buying flavored cigars (AOR=0.73, 95% CI=0.58, 0.91). Regardless of jurisdiction, however, certain population subgroups were significantly more likely to report difficulty to access: flavored cigars (Asian, Hispanic, LGBTQ, residents in higher-income communities); flavored vaping products (AA, Hispanic); and menthol cigarettes (Asian, LGBTQ). CONCLUSIONS. With some exceptions, these findings demonstrate that among many priority subgroups, there is a higher likelihood of reporting perceived difficulty to access flavored tobacco products in local stores, which may be an early indication of changing social norms that reflect the evolving policy environment in CA.

FUNDING: Federal; State

PS1-52

NOVEL INHIBITORS OF NICOTINE METABOLISM IN A MOUSE MODEL

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Nicotine addiction remains the most common form of addiction in the USA despite widespread societal acceptance of the harms of tobacco use. For example, in 2015, 68% of US adult cigarette smokers reported wanting to quit completely, but only 6% were successful. This striking disparity underscores the critical need for novel smoking cessation therapies. Towards this goal, we have undertaken the design and testing of a new class of compounds for the treatment of nicotine dependence. Nicotine's very short half-life directly contributes to its addictive characteristics and the repetitive smoking behavior seen in tobacco users. Therefore, our work has focused on nicotine analogues as inhibitors of cytochrome P450 2A6 (CYP2A6), the phase I enzyme that rapidly metabolizes nicotine. Preliminary *in vitro* analyses identified two compounds (5i and 6i) to undergo further testing for toxicity and efficacy in C57BL/6J mice. Both compounds were very well tolerated in the mice, with no visible toxicity after the mice received *i.p.* injections at doses up to 35 mg/kg of compound 5i and 125 mg/kg of compound 6i (corresponding to 2500x and 12,500x the IC_{50} of CYP2A6, respectively). Efficacy studies in the same mouse model investigated the compounds' effects on CYP2A5, the mouse homolog of human CYP2A6. Study design included groups of 3-5 mice, each of which received a 1 mg/kg subcutaneous injection of nicotine, followed by either an *i.p.* or a *p.o.* dose of compound 5i, 6i, or a PBS control. Nicotine plasma levels over 4 h were quantified using LC-MS/MS analysis. Results show that *p.o.* doses of 7 mg/kg of compound 5i and 125 mg/kg of compound 6i are able to significantly increase the half-life of plasma nicotine from 11.7 min with PBS control injections, to 20.7 and 39.8 min, respectively, with 5i and 6i treatments. Additionally, the same *p.o.* doses significantly increased the area under the curve (AUC) of nicotine by 1.7 and 3.8 fold, respectively, with 5i and 6i treatments. These data suggest that compounds 5i and 6i are nontoxic inhibitors of CYP2A5/2A6 and warrant further development as a new approach for the treatment of nicotine addiction.

FUNDING: State; Academic Institution

PS1-53

URBAN VERSUS NON-URBAN CHANGES IN YOUTH ELECTRONIC CIGARETTE USE

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Background: The prevalence of current electronic cigarette (e-cigarette) use has recently increased dramatically among youth in the United States. It is unknown whether the increase is uniform across urban and non-urban areas. Methods: Data were collected using an annual state-wide survey of middle and high school students in Kansas. The prevalence of current (past 30-day) e-cigarette use was compared between 2018 and 2019, overall and across urbanicity using Rural-Urban Commuting Area Codes (RUCAs) and whether the area has increased the minimum age of purchasing tobacco products to 21 (T21). Multivariable logistic regression was performed to examine the temporal change in current e-cigarette use. Results: Of 132,803 participants included in the final analysis, the prevalence of current e-cigarette use increased by 54% from 8.2% in 2018 to 12.6% in 2019. The increase was not uniform across urban and non-urban areas with a 2.1 percentage-point increase (from 9.8% in 2018 to 11.9% in 2019) in the urban area

versus a 6.7% percentage-point increase (6.7% to 13.4%) in the non-urban area. In the multivariable analysis, there was a significant interaction effect of year \times urbanicity ($p < .0001$). The increase in current e-cigarette use was much smaller in urban (AOR=1.3 CI [1.2-1.4]) than in non-urban (AOR=2.3 CI [2.2-2.4]) areas. In urban areas, we found no significant change of current e-cigarette use in areas with a T21 policy (11.8% in 2018 vs. 11.7% in 2019, $p=0.8415$) but a significant increase in areas without a T21 policy (8.1% in 2018 vs. 12.0% in 2019, $p < .0001$). In non-urban areas, the increase in e-cigarette use was smaller in areas with a T21 policy than in areas without a T21 policy (a 2.9 percentage-point increase from 7.9% to 10.8% vs. a 7.2 percentage-point increase from 6.5% to 13.7%, respectively). Conclusions: This study is the first to report marked disparities in the increase of youth e-cigarette use with a much larger recent increase in non-urban than in urban areas. There is also some indication that T21 policies may curb increases in e-cigarette use among youth. Continuous efforts to reduce e-cigarette use, especially in non-urban areas, is critically needed.

FUNDING: Nonprofit grant funding entity

PS1-54

EUROPEAN MARKET ASSESSMENT OF NICOTINE CONTENT POST TOBACCO PRODUCTS DIRECTIVE

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Introduction: The European Union has implemented the Tobacco Products Directive (TPD) to assure the quality and safety of these products. To maintain quality of e-cigarette products, TPD has specified regulations on ingredients and limits of nicotine concentration (<20 mg/mL) in e-liquids. To assess the Good Manufacturing Practices (GMP) of e-cig products in the European market, we evaluated e-liquids based on their nicotine concentration accuracy as an indicator of good quality control. **Methods:** This study was performed on 80 e-liquids representing 34 brands and 57 flavors from 9 countries in Europe. The nicotine label content on the products ranged from 0 to 18mg/mL. There were 14, 3, 23, 3, 15, 1, 14, 2, and 11 e-liquids of 0, 1.5, 3, 4, 6, 9, 12, 16, and 18 mg/mL nicotine concentration, respectively. Nicotine analysis was carried out using a validated HPLC method based on a nicotine peak purity criteria. **Results:** Nicotine analysis results were categorized into 3 groups to check Accuracy ($\pm 2\%$), Stability ($\pm 10\%$) and Nicotine-Free Claim (0 mg/mL) of their respective label claims. The label claim deviation for nicotine for all e-liquids ranged from -100 to +142%. 56 samples failed to meet $\pm 2\%$ (52 less than and 4 greater than label claims). 16 samples failed to meet $\pm 10\%$ (14 less than and 2 greater than label claims). Samples with nicotine concentration from > 0 to 6 mg/mL, 34 failed $\pm 2\%$ and 14 failed $\pm 10\%$; from 9 to 12 mg/mL, 10 failed $\pm 2\%$ and 3 failed $\pm 10\%$; and from 16 to 18 mg/mL, 12 failed $\pm 2\%$ and 0 failed $\pm 10\%$. Out of 14 nicotine free e-liquids, 2 samples contained nicotine at 0.02 and 0.05mg/mL concentration. **Conclusions:** A substantial number of e-liquid samples failed to meet the accuracy ($\pm 2\%$) and stability ($\pm 10\%$) criteria. TPD does not specify acceptance criteria of label content for quality control of the e-liquid products. Label content and stability of products are crucial factors in GMP. Since nicotine is an active ingredient with pharmacological effect, it important for regulatory guidelines such as TPD to establish acceptance criteria such as USP/ICH for analytical testing of e-liquids. Such criteria will enforce GMP in e-liquids.

FUNDING: Federal; Nonprofit grant funding entity

PS1-55

JUUL DIRECT-TO-CONSUMER MARKETING: CHANGES IN CONTENT ACROSS REGULATORY AND MARKET ACTIVITIES

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Introduction: JUUL has become the leading brand of e-cigarettes in the US. While several of its manufacturer's marketing strategies have recently come under scrutiny, JUUL direct-to-consumer marketing has not been examined. We sought to examine the content of the JUUL emails sent directly to consumers and how the content changed in relation to regulatory and market activities. **Methods:** A female adult signed up to receive JUUL direct marketing emails. Emails received between December 2017 and April 2019 (N = 125) were coded using a coding scheme by two coders (Cohen's kappa: 0.7 to 1.0). Emails were separated into four observation periods (pre-FDA announcement of investigating JUUL for youth-targeted marketing, pre-FDA inspection of JUUL headquarters, pre-Altria shareholding, and post-Altria shareholding). Chi-square tests were used to determine differences in email content over the four observation periods. **Results:** Overall, more



than half of emails contained the word "flavor(s)" (57%) or showed flavor pods (75%). Emails containing the word "flavor(s)" significantly increased over time ($p < 0.001$). Price promotions were consistently high (75%) but dropped significantly during post-Altria shareholding (53%). A third of emails contained language directly addressed to adult smokers (31%), and those emails increased significantly post-Altria shareholding (82%, $p < 0.001$). Almost half of emails contained links to JUUL social media pages (44%), but no such links were present after FDA inspected JUUL headquarters. More than half of emails contained warning labels (66%), and those emails significantly increased over time ($p < 0.001$). Conclusion: JUUL used high volume email marketing on par with that for cigarette companies. Over the observation time, JUUL emails increasingly featured flavor promotion, despite FDA's warning on JUUL's appeal to youth. Emails also had a limited focus on adult smokers, despite JUUL's claims that adult smokers are their primary target. Altria's role in JUUL email marketing emerged as an area that warrants further investigation. Further regulatory actions are needed to ensure youth and non-smokers are not exposed to these emails.

FUNDING: Federal

PS1-56

ESTIMATED REACH OF US DIRECT MAIL TOBACCO DISCOUNTS BY PRODUCT TYPE AND CONSUMER DEMOGRAPHICS

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Direct-to-consumer discounts are a tobacco industry strategy to increase brand loyalty, reduce product price and increase consumption, particularly for price sensitive groups like low-income individuals and young adults. Estimating the volume or "reach" of direct mail discounts by recipient demographics (age, income) can highlight disparities in targeted promotion across tobacco product type and inform regulatory strategies. We acquired a one-year (Jan-Dec 2018) sample of US direct mail ads ($n=1,163$) from Mintel Comperemedia. Four authors coded ads for tobacco product (menthol cigarettes, non-menthol cigarettes, e-cigarettes, smokeless, cigars) and presence of coupons or general discounts. Overall reliability was substantial ($\kappa=0.85$). Estimates of direct mail volume provided by Mintel were summarized by recipient age and income, as well as product type. From Jan-Dec 2018, tobacco companies sent an estimated 627M pieces of mail. Overall, 72.5% of the total volume contained discounts. By product type, the proportion of total volume containing discounts was highest for non-menthol cigarettes (41.5%), smokeless tobacco (33.3%) and menthol cigarettes (28.5%) and lowest for cigars (4.0%) and e-cigarettes (3.0%). Within each product category, 23-28% of the ad volume contained discounts sent to low-income recipients. Additionally, 4.2% of the smokeless ad volume contained discounts sent to young adults followed by menthol (3.1%) and non-menthol cigarettes (2.7%), e-cigarettes (2.4%), and cigars (1.9%). In our sample, 455M direct mail pieces contained consumer discounts. Across tobacco products, the volume of ads with discounts sent to low-income or young adults was comparable suggesting brands across product types may target groups similarly. Overall, the proportional volume of ads with discounts sent to young adults was low. However, around one-quarter of ad volume for each product type contained discounts sent to low-income individuals. Restrictions on direct-mail coupons may reduce ad exposure for this price sensitive group and may be a particularly important strategy for cigarette smokers.

FUNDING: Other

PS1-57

DIVERGENT E-CIGARETTE REGULATORY POLICY AND POLITICS IN AUSTRALIA AND NEW ZEALAND: A COMPARATIVE CASE STUDY

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Significance: By almost any definition Australia and New Zealand are global leaders in the advancement of tobacco control policy. In 2016, the two countries had regulatory frameworks for e-cigarettes that were nearly identical and effectively banned the sale of nicotine-containing e-cigarettes. Australia has maintained a regulatory policy that aims to quash e-cigarette sales. New Zealand has begun moving towards adopting regulatory policies that aims to grow the e-cigarette market at the expense of tobacco cigarette sales. Through close examination of these two cases, lessons can be learned about the forces and events that drive regulatory policy change. **Methods:** This case study combined semi-structured key informant (policymakers, bureaucrats, academics,

health advocates, vaping advocates) interviews ($n=64$) conducted between September and November 2018 in both countries with extensive document reviews to illustrate how nicotine-containing e-cigarette regulatory policy in these two most-similar countries drifted apart. The study utilizes Kingdon's Multiple Streams Approach to explore the similarities and differences in the experience of each country with e-cigarettes. **Results:** Australia's policy decisions have been driven by a core policy community that has persuaded that country's policymakers that adequate tobacco control progress is being made and e-cigarettes do not have a role to play in the country. By contrast, policy entrepreneurs in New Zealand have successfully employed a problem frame, that the country will not achieve its Smoke-Free 2025 smoking prevalence reduction goals especially for indigenous Māori, and offered a policy solution that has achieved value acceptability across the political spectrum to open a window of opportunity for policy change. Institutional differences between the countries, specifically the role of New Zealand's mixed-member proportional Parliament, will be also highlighted as path dependent factors. **Conclusion:** Explaining what political conditions lead countries to change their regulatory policies can help understand how to more effectively campaign to shape other regulatory frameworks for commercial determinants of health.

FUNDING: Academic Institution

PS1-58

PERCEPTIONS ABOUT THE SMOKE-FREE HOUSING POLICY AMONG PUBLIC HOUSING RESIDENTS IN NEW YORK CITY: A MIXED METHODS STUDY ON POLICY IMPLEMENTATION

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Background: The U.S. Department of Housing and Urban Development's landmark smoke-free public housing policy has been in effect for a year. As part of a larger National Cancer Institute-funded study, we conducted focus groups (FGs) and surveys with residents in New York City Housing Authority (NYCHA) buildings, to assess the policy implementation process. **Methods:** In July 2019, guided by the socioecological model, we conducted 6 FGs with 47 residents in 3 NYCHA developments (3 FGs with smokers, 3 with non-smokers). We also conducted repeat surveys with a group of NYCHA residents living in 157 nonsmoking households immediately pre- and 6-months post-policy. **Results:** Main themes among nonsmokers and smokers were about ongoing, widespread violations of the policy; lack of supportive norms for resident enforcement (i.e., nonsmokers don't feel safe asking smokers to stop smoking); pervasive marijuana smoke exposure; frustration with lack of attention to other building and health-related issues that are high priorities for residents; and a need for smoking cessation services. All smokers reported continuing to smoke indoors. Most described feeling "punished" by the policy, were angry about being told what to do in their own apartment, and voiced concerns about consequences of policy violations (e.g., eviction). Survey data were consistent with FGs; most nonsmokers continued to support the policy but satisfaction with policy implementation and enforcement declined significantly from prior to 6 months post policy. Recommendations to promote compliance included more support from building managers and resident association, improved communication from NYCHA management, and enhanced enforcement efforts. **Conclusions:** Efforts are needed to embed the policy into a larger healthy housing agenda, enhance resident engagement—particularly with smokers—to address misconceptions and concerns, increase enforcement efforts, and expand smoking cessation services and communication. Innovative strategies are needed to change norms impeding self-enforcement (i.e., residents empowered to enforce the policy), a necessary component of successful policy implementation.

FUNDING: Federal

PS1-59

BEHAVIORAL AND HEALTH IMPLICATIONS OF SELLING ONLY VERY LOW NICOTINE CIGARETTES

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Background: In 2018, the US Food and Drug Administration proposed the concept of a product standard to lower the nicotine content in tobacco filler in order to reduce the abuse liability of smoking. Studies have suggested that very low nicotine cigarettes (VLNCs) would be associated with reduced addiction potential, lower levels of smoking initiation, reduced cigarette consumption, and increased cessation. **Objective:** To examine evidence of when cigarette manufacturers had the technical capability to reduce the nicotine content of cigarettes, and to model the behavioral and health impacts of



implementing a VLNC standard in three time periods - 1965, 1975, and 1985. **Methods:** A review of patents on the subject of nicotine extraction from tobacco, and previously secret internal cigarette company business records were undertaken to determine when cigarette companies had technical capability to reduce the nicotine content of cigarettes. To evaluate the behavioral and health impacts of a VLNCs on smoking behavior, smoking attributable deaths and life year lost, we used data from CISNET on past smoking initiation and cessation, and published estimates of the impact of a VLNC on future rates of cigarette initiation, consumption and cessation. We relied on estimates of the impact of VLNCs published by Apelberg et al. (2018) to estimate the impact of VLNCs on initiation and cessation rates. **Findings:** The feasibility of markedly reducing nicotine levels in cigarettes so as to render them non-addictive is demonstrated in patents and internal cigarette company documents going back decades. The current projections using the initiation and cessation rates, population and deaths by smoking status reveal that 11.6 million deaths (1 45% reduction) could and 161 life years lost (54% reduction) have been averted had cigarette companies chosen to only manufacture and sell a non-addictive cigarette starting in 1965. Had a VLNC standard been implemented by 1975, and 9.2 million deaths and 138 million life years lost would have been averted; delaying this intervention to 1985 the number of deaths averted falls to 6.8 million with 110 million life years gained. **Conclusions:** Had cigarette companies chosen to only sell VLNCs decades ago millions of premature deaths from smoking normal nicotine cigarettes could have averted. FDA should act immediately to engage the VLNC standard since the health consequences of delaying this reasonable public health standard are enormous.

FUNDING: Federal; Academic Institution

PS1-60

GLOBAL E-CIGARETTE ADVERTISING ON TWITTER AND INSTAGRAM

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Significance Euromonitor tracks e-cigarette sales in 66 countries; approximately, 80% of the world's adult e-cigarette users live in 10 countries. Little is known about how e-cigarettes are advertised globally. Social media platforms Twitter and Instagram represent an important medium for advertising e-cigarettes. The present study systematically searched these sites to identify e-cigarette ads tagged with country names. **Methods** In Twitter, search terms "#vape" and "#country name" (such as "#Canada") were searched using each of the 194 member states of the World Health Organization (WHO). In Instagram, search term "#vapeCountryName" was used, such as "#vapeCanada". Up to 3 ads (devices and/or e-liquids) were added to the sample from each platform. Ads were assessed for lexical and visual content related to flavor and nicotine content as well as the presence of a health warning. The presence of ads is reported for each of the 6 WHO regions. **Results** The search identified 700 ads including 296 ads from Twitter and 404 ads from Instagram. Ads were identified for 77% of WHO member states (n=149) including: 57% (n=26) of the African Region (AFRO), 95% (n=21) of the Eastern Mediterranean Region (EMRO), 100% (n=53) of European Region (EURO), 74% (n=26) of the Region of the Americas (PAHO), 82% (n=9) of South-East Asia (SEARO), and 52% (n=14) of Western Pacific Region (WPRO). Across the entire sample of ads, most (52%, n=362) made a lexical reference to flavor and 16% (n=113) made a lexical reference to nicotine. Most ads included an image of an e-cigarette device (53%, n=368) and an image of e-liquid (53%, n=372). Health warning labels were present on 2% (n=13) of ads in the sample. **Conclusions** E-cigarette ads are being promoted using Twitter and Instagram. Country-specific hashtags were identified for most WHO member states, including all members of the European Region. It is important to note that this study relied on hashtags using English names for countries. Further research is necessary to assess how marketing on social media platforms impacts public perception and influences use.

FUNDING: Academic Institution

PS1-61

AN AFFORDABLE DIY ELECTRONIC CIGARETTE AEROSOL DELIVERY DEVICE FOR FUNCTIONAL MAGNETIC RESONANCE IMAGING

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Background: Functional magnetic resonance imaging (fMRI) can provide an objective measure of electronic cigarettes' (e-cigs) neural effects to inform e-cig addiction and treatment; however, the metal components of e-cigs and the movement associated with e-cig use present challenges for fMRI. **Methods:** The aim of our study was to design, build, and test the properties of a device for controlled delivery of e-cig aerosols during fMRI. We collected repeated measures of air flow. Total nicotine from aerosols of varying nicotine concentrations (0, 8, 11, 16, 24, & 36mg) were trapped on Cambridge filter pads, extracted using methanol, and quantitated using GC/FID. Echo-planar imaging (EPI) fMRI sequences with and without the device present were conducted to test safety and scan quality, including temporal signal-to-noise ratio (tSNR), static field homogeneity (B0), and receive and transmit sensitivity (B1- and B1+). **Results:** The final device includes four chambers with Teflon tubing connecting the chambers to a computerized olfactometer that controls the timing and flow of air to each chamber and 4 feet of output tubing to a spacer for inhalation. Commercially available breath-actuated e-cigs with prefilled e-liquid cartomizers are connected inside each chamber. With olfactometer airflow of 4L/min, the air flow into the spacer ranged from 2-2.75 L/min. Aerosols collected from 8 ten-second puffs with 333ml puff volumes yielded the following nicotine concentrations per puff: 207µg/puff (36mg e-liquid); 202µg/puff (24mg), 187µg/puff (16mg), 129µg/puff (11mg); 62µg/puff (8mg); 3µg/puff (0mg). EPI scans confirmed its safety and demonstrated a low percent difference in scanner tSNR with the addition of the device (0.51%). **Discussion:** Our device safely delivers controlled e-cig aerosols containing nicotine into the scanner bore. Future device modifications will address variability in air flow and tubing contamination between aerosols given the weak correlations between e-liquid and aerosol nicotine concentrations and trace amounts in the 0mg aerosol. The next phase of the study is to test blood nicotine pharmacokinetics and to localize brain activity during aerosol delivery. **Support:** This project was supported by the Penn State College of Medicine Clinical and Translational Science Institute (UL1-TR002014) and the Highmark Gift Fund. ALH is supported by a National Institute on Drug Abuse career development award (K23-DA045081). The project was facilitated by the Penn State College of Medicine MRI Core Facility.

FUNDING: Federal; Academic Institution

PS1-62

VAPING AND SMOKING RULES IN AIRBNB VENUES IN 27 CITIES IN THE UNITED STATES

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Significance: Airbnb is the world's largest online service that helps broker short-term lodging between hosts and guests. There are approximately 600,000 Airbnb venues in the US. Hosts author descriptions of their venue and can detail prohibited or permitted activities. Hosts can also classify their venue as "smoking allowed" in the house rules section of the listing. This study reports the percent of Airbnb venues in the US that permit vaping and smoking. **Methods:** A publicly accessible database, InsideAirbnb, was used to identify a sample of Airbnb listings in 27 American cities (N=252,953). This included all US markets monitored by InsideAirbnb. Data were collected between April-June 2019. The database was searched using keywords "vape," "vaping," and "ecig-"; listings with these terms were reviewed and venues were categorized as vaping allowed or vaping not allowed. Venues were also classified if they were "smoking allowed" or not, based on posted "house rules". **Results:** Approximately 1.3% of venues (n=3,380) included details in the listing's descriptions specifying rules around vaping. Of these venues, the majority (77.9%, n=2,634) specified that vaping was prohibited in all areas of the property. The other venues (22.1%, n=746) permitted vaping either without restrictions (n=113) or allowed vaping in a specific room or outdoors (n=633). Across the entire sample, 4.4% of listings (n=11,090) were classified as "smoking allowed". When considering the 3,380 venues that specified both vaping rules, 6.7% (n=225) allowed vaping and smoking, 15.4% (n=521) allowed vaping while prohibiting smoking, 3.7% (n=126) allowed smoking while prohibiting vaping, and 74.2% (n=2,508) disallowed both. **Conclusions:** In this sample of US Airbnb venues, very few hosts specify if vaping is permitted in their venue. Few Airbnb venues in the sample are classified as "smoking allowed". Some venues that allow smoking do not allow the use of e-cigarettes and vice-versa. Airbnb hosts and guests could benefit from rules around vaping being explicitly incorporated into venue house rules.

FUNDING: Academic Institution



PS1-63

SMOKING-RELATED PERCEPTIONS ARE NOT SET IN STONE: USING ECOLOGICAL MOMENTARY ASSESSMENT TO TRACK VARIABILITY IN SMOKING RISK AND BENEFIT PERCEPTIONS

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Risk and benefit perceptions are assumed to be stable within people over time, despite evidence that one's emotions and cognitions vary considerably from one context to another. This assumption may overlook a critical component of how these perceptions change, leading to suboptimal cessation interventions. Mandatory cost effectiveness analyses of smoking-related policies are also predicated on the assumption that perceptions are stable, so failure to consider whether perceptions change impacts tobacco policy. Using ecological momentary assessment, we tracked the variability of smokers' risk and benefit perceptions related to cigarette use over one week. At four semi-random times each day, participants ($n = 41$) responded to a short survey that assessed beliefs about smoking-related health, social, and affective consequences. We used hierarchical linear modeling to determine whether variation in responses could be attributed to between-person or within-person variability, with the latter allowing both day-level and momentary-level variation. Within-person differences measured at the momentary-level accounted for a small but consistent amount of the variability in beliefs about immediate health risk (19%), the health risk of the next cigarette (23%) and risk of social conflict (21%). These within-person differences also accounted for some of the variability in beliefs about whether smoking improves social connectedness (27%), whether the benefits of smoking outweigh the risks (42%), and whether smoking relieves stress (34%) or increases relaxation (49%). Risk beliefs had high levels of stability across people, but at least a fifth of variance in these beliefs still varied within-person. Moreover, benefit perceptions had much higher levels of within-person variability. These findings run counter to many policies that are designed with the assumption that cognitions have a consistent influence on behavior. These findings further suggest that positive perceptions may be more malleable due to their greater within-person variability, but more research at the moment-to-moment microenvironment is needed to understand how this relates to cessation successes and failures.

FUNDING: Academic Institution

PS1-64

POLICY DEBATES REGARDING NICOTINE VAPING PRODUCTS IN AUSTRALIA QUALITATIVE ANALYSIS OF SUBMISSIONS TO A GOVERNMENT INQUIRY FROM HEALTH AND MEDICAL ORGANISATIONS

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Significance: Evaluating the different policy framings and associated claims in policy debates can help us to understand how the government defines and approaches nicotine vaping products (NVPs) related policies. The aim of this study was to assess NVP related policy frameworks and regulatory options that have been recommended by healthcare professionals (HCPs) and institutions involved in health policy, and evaluate the discourses used to describe them. **Methods:** We qualitatively analysed 41 submissions made to a Federal Parliamentary Inquiry into the use and marketing of NVPs in Australia. Submissions came from Australian institutions that form or contribute to health policy including government agencies, peak health bodies and charities, public health academics and HCPs. Data were coded using NVivo 12 software and thematically analysed. **Results:** The majority of submissions from legislators, health bodies and charities recommended against relaxing current restrictions on the regulation of nicotine for use in NVPs, with the key arguments being (1) perceived lack of scientific evidence regarding the efficacy of NVPs as an aid for quitting smoking; (2) difficulty of inferring the likely health outcomes for smokers who switched to vaping based on the current scientific evidence; (3) potential unknown health risks from long term use of NVPs; (4) health risks of dual use, and (5) potential for NVPs to be a gateway to smoking among young people. In contrast, majority of HCPs and public health academics stressed the role NVPs have in reducing tobacco-related harm and advocated for widening access to NVPs for smokers. There was widespread support for restrictions on sales, advertising and promotion, with most submissions supporting similar controls as for tobacco products. **Conclusion:** A number of barriers to widening access to nicotine for use in NVPs were evident, including the demand for long-term evidence that confirms an im-

possibly high standard of safety and efficacy. There was less consideration of potential unintended consequences of an overly cautious regulatory approach that maintains greater restrictions on nicotine in less harmful forms compared to tobacco cigarettes.

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PS1-65

YOUNG ADULT EXPOSURE TO VAPE SHOPS AND VAPE SHOP MARKETING AND RELATED PERCEPTIONS OF VAPING

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Significance: Recent proliferation of vape shops coincides with an epidemic of youth and young adult vaping. Assessing young adult exposure to vape shop marketing is critical to understand its impact and inform regulation. **Methods:** Using Facebook and Reddit, we recruited 3004 young adults (ages 18-34) residing in Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, and Seattle. We assessed vape shop awareness, marketing exposure, and perceptions and use of vape products/industry. **Results:** Participants' average age was 24.6 (SD=4.7); 42% were male, 70% non-Hispanic White, and 11% Hispanic; 65% vaped in the past 30 days. Nearly all (97%) reported awareness of vape shops and first learned about them from environmental exposure (i.e. seeing them, 64%), friends (52%), and advertising (26%). In the past 30 days, 64% saw vape shop ads; the most common channels were social media (43%), retail signage (31%), billboards (20%), newspapers/magazines (13%), radio (11%), TV (11%), and email (10%). Overall, 58% had visited a vape shop (20% >10 times). Among the 52% who purchased vape products in the past year, 32% purchased them at vape shops, 34% online, 10% at convenience stores, and 7% at tobacco specialty stores. Only 34% of current users were almost always asked for age verification to purchase, 15% rarely, and 18% never. E-cigarettes were rated more favorably than cigarettes, cigar products, smokeless tobacco, and hookah with regard to likelihood of next-year use, health risks, social acceptability, and addictiveness (0=not at all to 7=extremely). Average ratings (0-7) are reported: vaping is effective for cessation: 4.3 (SD=1.9); vape shops are invested in helping smokers quit: 2.5 (SD=1.8); vape shops try to get people to start using nicotine: 4.3 (SD=2.0); the tobacco industry is involved in the vape shop industry: 4.6 (SD=1.8) or e-cigarette industry: 4.8 (SD=1.8); and vape shops are involved in selling illicit drugs: 2.9 (SD=1.8). Significant differences regarding vaping and vape shop related behaviors and attitudes existed across cities. **Conclusions:** Vape shops influence young adult awareness and perceptions of vaping. Enforcement of age verification is needed.

FUNDING: Federal

PS1-66

HOME SMOKING AND VAPING POLICIES AMONG US ADULT CIGARETTE SMOKERS, VAPERS, AND DUAL USERS-RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVE 3

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Background: Most US adults have voluntary rules to prohibit smoking inside their home; however, rules for prohibiting vaping inside their home are still unclear. This study examined the prevalence of home smoking and vaping restrictions among US adults, and compared home policy differences for smoking and vaping among vapers, smokers, and dual users. **Methods:** Data from the Population Assessment of Tobacco and Health (PATH) Study Wave 3 collected from October 2015 to October 2016 with 28,148 adults were analyzed. Weighted multivariable logistic regression models that account for complex sampling design were used to compare differences in home policies for smoking and vaping among non-users of any products, those who only vape, those who only smoke, and dual users. **Results:** The weighted prevalence of prohibiting smoking and vaping inside home were 83.78% and 79.41% respectively. Compared to never-users, current vapers who were ex-smokers were more likely to allow vaping (aOR = 20.87, 95% CI: 14.28 - 30.49) and smoking (aOR = 1.39, 95% CI: 1.01 - 1.91) inside the home. Current vapers who never smoked were more likely to allow vaping



inside the home than never-users (aOR = 3.76, 95% CI: 1.93 - 7.34), but were not statistically significantly different from never-users on smoking rules inside the home (aOR = 1.60, 95% CI: 0.82 - 3.15). Dual users were also more likely to allow vaping (aOR = 13.48, 95% CI: 10.04 - 18.08) and smoking (aOR = 3.98, 95% CI: 3.08 - 5.14) inside homes than never-users. Current vapers who were ex-smokers and dual users had significantly higher adjusted odds ratios of allowing vaping than smoking inside homes. Current smokers were significantly more likely to allow vaping (aOR = 4.70, 95% CI: 4.30 - 5.49) and smoking (aOR = 4.85, 95% CI: 4.15 - 5.68) inside homes than never-users. Among current smokers, a difference in adjusted odds was not detected between smoking and vaping policies inside homes. **Conclusions:** Vapers may use e-cigarettes for personal harm reduction but allow vaping inside their homes at higher rates, potentially increasing risks to household occupants from preventable second- and third-hand exposure.

FUNDING: Federal; Nonprofit grant funding entity

PS1-67

PERCEPTIONS OF VAPING AMONG SMOKERS AND NON-SMOKERS

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SIGNIFICANCE: Several studies have documented misperceptions of vaping that may deter vaping uptake among those who could benefit, if they switched completely from smoking to vaping. Misperceptions could also support vaping uptake among non-smokers, who may then face health risks. We investigated how smokers and non-smokers perceive the risks and benefits of electronic nicotine delivery systems (ENDS) relative to smoked tobacco. **METHODS:** An online survey of 519 New Zealand smokers (S; including 270 vapers (SV)) and 486 non-smokers (NS; including 54 vapers (NSV)) sourced from the Dynata panel estimated attitudes to, and knowledge of e-cigarettes and vaping, using agree-disagree statements and forced-choice questions. We used descriptive analyses to compare perceptions of vaping and smoking. **RESULTS:** Vapers were significantly more likely than non-vapers to believe e-cigarettes are less harmful and less addictive than cigarettes (SV=53% cf. S=39%; NSV=67% cf. NS=48%; p<0.05), and to see second-hand vapour as less harmful than second-hand smoke (SV=55% cf. S=39%; NSV=67% cf. NS=49%; p<0.05). Vapers were more likely than non-vapers to see ENDS as less addictive and always useful in helping smokers to quit smoking. Vapers were also much more likely than non-vapers to agree that vaping smelled better than smoking (SV=73% cf. S=51%; NSV=78% cf. NS=56%) and that vaping helped smokers quit smoking completely (SV=51% cf. S=23%; NSV=61% cf. NS=22%). Non-smoking vapers typically had the most positive beliefs about vaping, though non-vapers reported high levels of uncertainty (up to 37%). **CONCLUSIONS:** Vapers had consistently more positive attitudes to ENDS and vaping than non-vapers. Although we found no evidence smokers who did not vape regarded ENDS as more risky than smoking, their less positive attitudes suggest providing better information about vaping's potential benefits to them could support smoking to vaping transitions. However, non-smoking vapers' highly positive attitudes suggest stronger interventions are needed to deter uptake among groups that will not benefit from ENDS use.

FUNDING: Federal

PS1-68

INFLAMMATORY BIOMARKERS CHANGES INDUCED BY EXPOSURE TO E-CIGARETTE VAPE IN RATS

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Significance: E-cigarettes is a form of tobacco use that has increased considerably in recent years. In the present study, changes in inflammatory markers have been studied in lung tissues and bronchoalveolar lavage fluid (BALF) of rats exposed to e-cigarettes vape for 1, 2 and 4 weeks. **Methods:** BALF and lung tissues were sampled from rats exposed to e-cigarettes vape as a standard solution of (70/30) PG/VG ratio with 18 mg/ml; nicotine concentration for 1 hr/day, every day, for 1, 2 and 4 weeks and compared to room air-exposed controls. Inflammatory biomarkers including TNF α , IL-6 and IL-10 were assessed. **Results:** Results showed that exposure of animals to e-cigarettes vape resulted in a significant increase in TNF α in the lung tissue after 1, 2 and 4 weeks of exposure (P-value < 0.05). In addition, the level of IL-10 significantly decreased after 1 week of exposure. However, no changes in the levels of examined

markers and total protein in BALF were observed after exposure to e-cigarettes vape. **Conclusion:** Current results indicate that e-cigarettes vaping could be associated with changes in TNF α and IL-10 that might predispose users to lung inflammation.

FUNDING: Academic Institution

PS1-69

AN ANALYSIS OF FACTORS PROMPTING ENDS USE AND DISCONTINUATION AMONG FORMER VAPERS

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SIGNIFICANCE: Although smokers who transition fully from smoking to vaping may reduce the risks they would otherwise face, not all smokers successfully make this switch. Non-smokers' use of electronic nicotine delivery systems (ENDS) also requires investigation, as ENDS are not risk-free. Greater knowledge of factors prompting ENDS use and discontinuation could inform measures that sustain uptake among smokers, and limit trial and continued use among non-smokers. **METHODS:** We conducted an online survey of 1005 New Zealanders that included 232 former vapers (previously vaped but no vaping in the last 30 days; 148 smokers; 70 former smokers, and 84 non-smokers). The sample was sourced from Dynata, an online panel provider; the survey examined factors prompting former vapers to use and then stop using ENDS. We developed logistic regression models to compare reasons for discontinued ENDS use among these three groups. **RESULTS:** Former vapers, particularly non-smokers, cited curiosity as the key reason prompting ENDS use. Smokers and former smokers were more likely than non-smokers to cite reduced health risks as a reason for vaping (ORs 2.01 and 2.56; p<0.01), and smokers were more likely than former smokers or non-smokers to cite affordability (OR 3.63; p<0.001). Smokers were more likely than former smokers or non-smokers to have stopped vaping because it was not satisfying (OR 3.12; p<0.001). Smokers and former smokers were less likely than non-smokers to have stopped vaping because of health concerns (ORs 0.36; 0.27; p<0.001), discomfort from vaping in public (ORs 0.45; 0.35; p<0.01), concerns vaping annoyed others (ORs 0.42; 0.39; p<0.01), or concerns they could become addicted to vaping (ORs 0.33; 0.25; p<0.01). **CONCLUSIONS:** Although curiosity was the main reason prompting ENDS use among smokers, former smokers and non-smokers, reasons for ceasing ENDS use varied. Lack of satisfaction prompted relapse to smoking, which suggests smokers may need better initial advice about the device and e-liquid they use, and encouragement and support to persist with vaping. Non-smokers took up vaping piqued by curiosity, which raises the possibility that measures reducing exposure, such as marketing and supply restrictions, could deter uptake among those who will not benefit from ENDS use.

FUNDING: Federal

PS1-70

SUPPORT FOR ENDS REGULATION AMONG SMOKING AND VAPING GROUPS

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SIGNIFICANCE: Increasing vaping uptake has raised questions about how policy makers could ensure marketing of electronic nicotine delivery systems (ENDS) targets smokers who may benefit from switching to vaping, while minimising non-smokers' exposure to the sale and promotion of ENDS products. We examined support for different policy measures that could realise these outcomes. **METHODS:** We used an online survey of 519 New Zealand smokers (including 270 vapers) and 486 non-smokers (including 54 vapers) to examine perceptions of ENDS regulation, including ENDS marketing and sales, and spaces where ENDS use is permitted. We used 5-point oppose-support scales and forced-choice questions to estimate respondents' views, and developed logistic regression models to estimate support for varied regulatory proposals. **RESULTS:** ENDS users gave less support than non-users to proposals that would limit e-cigarette marketing or restrict where vaping might occur. Non-smoking non-ENDS users (reference group) were significantly more likely than all other groups to support not allowing vaping in places where smoking is already banned (ORs 0.15-0.41; all p<0.001), requiring plain packaging for vaping products (ORs 0.18-0.58; all p<0.001), and restricting sales of e-cigarettes and e-liquids to licensed 'vape stores' (ORs 0.36-0.43; p<0.01). Irrespective of ENDS or smoked tobacco use, respondents supported not allowing ENDS advertising on billboards, bus shelters and buses, or on television. A large majority of all groups believed that e-cigarette advertising should have restricted broadcast times (72%-84%) and should not be allowed near where young



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people gather (60% to 82%). **CONCLUSIONS:** Policy makers could act on the support all smoking and vaping groups gave to policies that could prevent ENDS uptake among young people, including regulating purchase age, nicotine labels and addiction warnings. All groups supported restrictions on marketing and advertising that would limit young people's exposure to ENDS promotions.

FUNDING: Federal

PS1-71

FRAMING OF TOBACCO CONTROL POLICY ARGUMENTS IN THE INDIAN NEWS MEDIA (2014-2018)

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Background India is one of the largest tobacco-producing countries in the world, and its people bear a considerable burden of tobacco use. The government of India had made strides in protecting the health of their citizenry through the adoption and passage of more stringent tobacco control legislation. This study examined news media coverage of tobacco control in India between 2014 and 2018. This timeframe represents the period during which two key tobacco-control related policies - the Goods and Services Tax (GST) and Pictorial Warning Labels (PWL) - were introduced and passed. Methods We used a Boolean search strategy to identify news articles about tobacco control and the tobacco industry, yielding of a total of 3,232 stories. Using stratified sampling with "year" as the strata, we sampled 10% of days within each year, units from the sampling frame. After removing articles that mentioned tobacco but were not concerned with tobacco control or the tobacco industry, a total of 107 articles were included in the analysis. Articles were coded for policy type, policy risks/benefits cited, and stakeholders cited. Results A range of tobacco control policies were covered, including GST (35%), PWL (18%), and other policies (e.g., product bans, and smoke-free) (47%). Articles about PWL almost exclusively cited health-related benefits of the policy while articles about GST also included mention of economic benefits such as increased tax revenue and lowered healthcare costs (48% and 13%, respectively). Economic arguments - smuggling (53%) and negative impacts on the manufacturing (47%) and farming (26%) sectors - were commonly cited as risks of tobacco control policy. A variety of stakeholders were cited across policy types. Government officials were the most commonly cited stakeholders (52%) followed by industry representatives (31%) and, for articles about GST, business owners (42%). Conclusions The results of this study suggest that media coverage of tobacco control policy in India was largely supportive of PWL, while coverage of GST was mixed. Arguments against tobacco control were largely consistent with the agenda of anti-tobacco control forces, underplaying the benefits of the proposed policies and exaggerating their costs.

FUNDING: Nonprofit grant funding entity

PS1-72

CIGARETTE AND E-CIGARETTE RETAIL MARKETING ON AND NEAR CALIFORNIA TRIBAL LANDS

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Significance: Retail settings have become major channels for the tobacco industry to market commercial tobacco products. Yet, few studies have examined marketing strategies on Tribal lands. Evidence on such marketing is needed, given that American Indian/Alaska Native youth and adults have the highest smoking prevalence of any racial/ethnic group in the U.S. In this study we examined differences in cigarette, e-cigarette, and vape/vaporizer availability, advertising, and price-reducing promotions in retail settings on and within a 1-mile radius of Tribal lands in California. **Methods:** Trained community health workers (n=8) conducted store observations/audits (n=96) using a checklist adapted from the Standardized Tobacco Assessment for Retail Settings (STARS) observation tool. Chi-square analyses were performed to examine differences in availability, exterior advertising, and price promotions for cigarettes, e-cigarettes, and vapes between stores. **Results:** All stores sold cigarettes and over 95% sold menthol cigarettes. Nearly 25% of stores on Tribal lands were located inside a casino, and 40.4% of stores on Tribal lands offered a Tribal member discount. Stores within a 1-mile radius of Tribal lands sold significantly (p < 0.01) more e-cigarettes (69.8%), including flavored e-cigarettes (53.4%) compared to stores on Tribal lands (37.7% and 28.3%, respectively). Price promotions for cigarettes were significantly (p < 0.01) more common in stores located within a 1-mile radius of Tribal lands (46.5%) than stores on

Tribal lands (22.6%). **Conclusion:** The tobacco industry uses stores on and near Tribal lands in California to widely market cigarettes and e-cigarettes and stores on Tribal lands disproportionately offer Tribal discounts for tobacco products. Tribal governments should consider policies to restrict flavored e-cigarette sales, Tribal discounts, cigarette price promotions, and tobacco sales in casinos.

FUNDING: Federal

PS1-73

CHARACTERIZING NATURAL FLAVORED TOBACCO CONTENT ON INSTAGRAM

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Significance: Amid declining cigarette sales in the U.S., consumption of machine-manufactured, mass-merchandise cigars like the brand Backwoods has increased substantially since the 2009 Family Smoking Prevention and Tobacco Control Act. Backwoods is one of the most popular cigar brands among young adults. Concept flavors (e.g., sweet aromatic, dark stout) and descriptors such as "authentic" and "all natural tobacco" in the marketing of Backwoods imply reduced harm. An emerging social context in which Backwoods cigar use is becoming increasingly apparent is Instagram. This study sought to characterize Backwoods cigar-related content on Instagram, including content that implies reduced harm. **Methods:** Trained coders conducted a content analysis of a random sample (N = 150) of Backwoods cigar-related posts on Instagram. Posts were coded in terms of characteristics (i.e., number of followers), characteristics of individuals in the post (i.e., perceived gender), and imagery/messages included in the post (i.e., "nature-related" imagery). **Results:** Posts had an average number of 1,025 followers. Approximately 30% of the individuals in the post were perceived as male and 24% as female. Thirty-five percent of posts were Backwoods packaging with specific flavors (e.g., vanilla, wild n mild), 25% were Backwoods packaging with specific descriptors "natural" or "authentic", 23% were marijuana-related, 15% had hashtags related to brand-specific flavors (e.g., #Russian crême, #dark stout), 15% were "nature-related" (e.g., images of water, plants, trees), 12% had hashtags related to brand descriptors (e.g., #natural, #authentic, #raw), 11% showed at least one person smoking or holding a Backwoods cigar without the presence of marijuana, 11% were of Backwoods promotional merchandise (e.g., t-shirts, slide sandals, hats), and 3% were memes. **Conclusions:** Study findings suggest that the promotion of Backwoods content on Instagram could influence social norms surrounding cigar use and convey reduced harm. Future studies should continue to monitor Instagram content and fully exploit the potential of such media for efforts to counter pro-Backwoods cigar-related images/messages.

FUNDING: Federal

PS1-74

USE OF PRICE-REDUCING PROMOTIONS FOR E-CIGARETTES AMONG ADOLESCENT E-CIGARETTE USERS: A PROSPECTIVE COHORT STUDY

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Significance: E-cigarette use is steadily increasing in the U.S., especially among youth. Tobacco companies' price-reducing promotions (coupon, rebates, 2 for 1) have been evolving with the rapidly changing tobacco landscape, yet the extent to which e-cigarette use among youth is due in part to the use of price promotions is unknown. **Methods:** We analyzed data from 1,609 11th and 12th grade students recruited from a prospective cohort study in Southern California. We assessed self-reported use of price promotions for e-cigarettes in the past 30 days among respondents who reported past 30 day use of e-cigarettes at baseline (2015-2016) and follow-up (2018-2019). Logistic regression models were used to evaluate the association of price promotions at baseline with continued product use at follow-up. **Results:** Among past 30 day e-cigarette users at baseline (N = 195), 57.4% were males, 48.7% self-identified as non-Hispanic White, 36.7% reported having made at least one attempt to quit smoking in the past 12 months, and 12.6% reported using price promotions. Buy-one get-one free was one of the most commonly reported (42.8%) type of price-promotion used to buy e-cigarettes. Hispanic adolescent past 30 day e-cigarette users at baseline were significantly more likely to use price promotions, the odds were more than three times higher (OR=3.36, 95% CI=1.07, 10.57) versus their non-Hispanic White counterparts. As young adults at follow-up, Hispanic past 30 day e-cigarette users were less likely to use price promotions



versus non-Hispanic Whites. **Conclusion:** Our findings add to the knowledge about price promotions for e-cigarettes among adolescent e-cigarette users, including use of price promotions among racial/ethnic minority youth. Future studies need to examine if use of price promotions is associated with subsequent e-cigarette use.

FUNDING: Federal

PS1-75

DIFFERENCES BETWEEN COUNTRIES AND CHANGES OVER TIME IN NOTICING HEALTH WARNING LABELS ON E-CIGARETTES: FINDINGS FROM THE 2016- 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: E-cigarette health warning labels (EC HWL), covering 30% of the pack in black and white text, and health and safety leaflets (HSL), were introduced in England (EN) from 20th May 2016 to 20th May 2017. **Aims:** This quasi-experimental study examines noticing EC HWLs and HSLs in EN compared to the United States (US), Canada (CA) and Australia (AU). Examine 1) country differences in noticing EC HWL and HSL and 2) changes over time in noticing EC HWL and HSL pre and post full implementation in EN compared to other countries. **Methods:** Data N=10789, adult (age 18+) current EC users from the International Tobacco Control Project surveys in EN, the US, CA and AU for Waves 1 (2016) and 2 (2018). **Outcomes:** Noticing HWL and HSL on/included in EC and e-liquid packaging. **Analyses:** Weighted GEE, controlling for socio-demographics, having EC-using family/friends, frequency of EC use, were used to test for country differences, differences over time and interactions by country. **Results:** **HWL:** Overall, noticing across waves in EN (14.1%) was lower than the US (17.4%; OR=1.28[1.01-1.62]), higher than CA (11.0%; OR=0.75[0.61-0.92]), but no different to AU (12.5%; OR=0.86[0.56-1.32]). Between 2016 and 2018 noticing increased in EN (7.7-20.2%, p=.001) and AU (7.0-16.3%, p<.001), but not in the US (17.8-17.0%, p=0.79) or CA (11.4-10.6%, p=0.52). The change in EN was greater than the US (OR=0.30[0.20-0.45]) and CA (OR=0.31[0.20-0.45]), but no different to AU (OR=0.81[0.43-1.52]). **HSL:** Overall, noticing across waves in EN (28.4%) was higher than the US (24.9%; OR=0.83[0.69-0.99]) but no different to CA (26.8%; OR=0.92[0.79-1.08]) or AU (29.8%; OR=1.08[0.81-1.45]). Between 2016 and 2018 noticing increased in EN (22.9-33.6%, p<.001), but not in the US (25.1-24.7%, p=0.998), CA (26.4-27.3%, p=0.64) or AU (27.3-31.5%, p=0.532). The increase between waves in EN was greater than in the US (OR=0.58[0.41-0.82]) and CA (OR=0.60[0.46-0.81]), but no different to AU (OR=0.69[0.40-1.19]). **Conclusion:** Noticing EC HWL and HSL in EN increased after they became mandatory. Other country findings will be discussed in relation to their EC HWL and HSL policies.

FUNDING: Federal

PS1-76

REGULAR AND NEVER VAPERS: HOW DO THEY DIFFER?

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Significance With an increasing trend in youth vaping uptake, it is crucial to understand what behaviours, social factors and other characteristics differentiate those who choose to vape regularly and those who do not. Specifically, there is a gap in knowledge regarding the factors that are associated with youth and young adults who vape regularly, especially among those who are not doing so to stop smoking. **Methods** In 2018, 1048 16-25 year old Canadians were recruited through online social media platforms to complete a survey. Quota sampling was used to target 60% of the total sample to be regular vapers, and the remaining 40% to be non-regular or never vapers. This analysis compared regular vapers and never vapers. Regular vapers were determined by those vaping at least weekly for the past month. Never-regular vapers were participants who had never tried vaping or those who had tried vaping less than ten times in their lives but have never vaped regularly. A logistic regression analysis compared these two groups on various social, behavioural and demographic characteristics. **Results** Various substance use variables including smoking, cannabis and alcohol use increased the odds of being a regular vaper. Having some or most of one's friends who vape, compared to none, significantly increased odds of being a regular vaper. Being older, male and perceiving there to be minimal risk associated with nicotine containing- e-cigarette use

also increased the odds of being a regular vaper. **Conclusion** Understanding how various social, behavioural and demographic characteristics affect the odds of being a regular vaper can help identify at-risk groups. Specifically, understanding how personal substance use and social-group e-cigarette use is associated with regular vaping will help target preventative and cessation interventions.

FUNDING: Other

PS1-77

TRANSPLENTAL EXPOSURE AND FETAL RESPONSES WITH MATERNAL OVINE E-CIGARETTE EXPOSURE

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Significance: EC use is rapidly increasing among women of reproductive age with misperceptions that these products are safer than tobacco during pregnancy. Studies suggest pregnant women may elect to use ECs and that lower cessation rates occur with vaping as compared to smoking in this cohort. However, fetal exposure with maternal vaping remains inadequately characterized. Use of a pregnant ovine model with paired fetal and maternal blood sampling as well as continuous fetal monitoring was utilized to evaluate trans-placental chemical exposures and fetal physiologic responses with maternal vaping. **Methods:** Pregnant ewes were anesthetized and ventilated at term gestation for fetal delivery by cesarean. Fetal lambs were maintained on placenta but partially exteriorized for instrumentation including placement of invasive catheters for serial blood sampling and hemodynamic monitoring. Baseline blood gases, blood samples and hemodynamics were obtained after instrumentation. 10 x 70 ml puffs of aerosolized vapor generated from a menthol flavored JUUL device was subsequently delivered to the ewe via a closed ventilator circuit with manual bagging. Maternal and fetal blood samples were obtained every 5-10 minutes following aerosol delivery for analysis by UPLC and GC MS. Serial blood gases were analyzed and data from continuous hemodynamic monitoring of the fetus was collected. **Results:** Efficient transplacental transfer of nicotine or cotinine occurred with peaks of both cotinine and trans-3-hydroxycotinine levels at 20 and 40 minutes in the ewe and fetus, respectively. GCMS of paired samples from 50 minutes following aerosol exposure identified numerous flavoring chemicals present in both maternal and fetal blood. However, some flavoring chemicals were noted only in maternal samples while select flavoring chemicals were only documented in fetal blood. Continuous fetal monitoring identified progressive hypotension, acidosis and increased lactate levels after aerosol exposure. **Conclusion:** Maternal use of EC products results in efficient transfer of both non-flavoring and flavoring chemicals to the fetus. Continuous fetal monitoring suggests compromised hemodynamics with exposure, although the specific cause for these effects remains unknown. Despite limitations of this animal model, our data suggests that select flavoring chemicals which fail to cross the placenta may be safer options. Further, these novel data support the cautious use of EC in pregnancy and advocate for further study of the vulnerable fetal population exposed.

FUNDING: Unfunded

PS1-79

SMOKEFREE POLICIES IN NEW ZEALAND NATIONAL SPORTING FEDERATIONS

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Significance: The WHO advocates for the use of community settings in the establishment of policies that seek to improve health. If National Sporting Federations (NSF) consider health outcomes when developing their policy documents this could potentially positively impact on sports clubs. There is a lack of information available on smokefree policies in NSFs. This research seeks to identify in the New Zealand context: 1) whether the 105 NSFs have smokefree policy documentation and 2) whether this documentation is comprehensive and in-line with 'best practice' and 3) the process for policy development, implementation, review and dissemination. **Methods:** This cross-sectional study collected data utilising searches of NSF websites for policy documents and phone interviews of NSF staff using a structured interview guide. Analysis was deductive using a best practice framework to benchmark each smokefree policy against. During the interview, participants were asked about the process by which policies are initiated, developed, implemented, reviewed and disseminated to regional, club and individual sports participants. Thematic analysis was inductive. **Results:** Of 96 NSFs who met the inclusion criteria, eight had a full and ten a partial smokefree policy, and 29 mentioned smokefree within other policy documents. No policy met all the 'best practice' requirements. Interviews were conducted with staff from 57 NSFs. Policies were usually



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initiated and drafted by the CEO or board members in a reactionary or needs based way, or on the advice of an external body. The membership generally had limited input into policies. Most organizations reported that they formally reviewed their existing policies annually. Overall, the sharing of policy documents with individual members was uncommon. **Conclusion:** Although nearly half of the NSFs mentioned smokefree at least once in their policy documents, the comprehensiveness of the policies was generally poor. NSFs may be in the best position to support health related behaviours among their membership, either by instituting policies and regulations, delivering health promotion interventions or co-ordinating the actions of clubs.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS1-80

NICOTINE AND FLAVORING COMPARISON OF JUUL E-CIGARETTE FROM THE US AND THE UK

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Significance: The use of the Juul e-cigarette in the US has increased dramatically in recent years, primarily among teenagers and young adults. Since there is no maximum limit for nicotine concentration in e-cigarettes sold in the US, Juul is available on the market with 5.0% nicotine solution. However, the EU Tobacco Products Directive (TPD) limits nicotine content in e-cigarettes to 20 mg/ml (2.0%). As a result of this regulation, Juul is sold with 1.7% nicotine solution in the UK. Other characteristics of the devices, like battery power and flavorings, are not regulated in both countries and manufacturers may modify those product features to enhance nicotine delivery and users' sensory experience. **Methods:** Juul devices and pods were obtained from both the US and the UK between February and May 2019 in all available flavors. Refill solutions from each product were analyzed for flavoring chemicals, nicotine and PG/VG concentrations using Gas Chromatography with Mass Spectrometry (GC-MS). We also tested nicotine yields in aerosols generated from Juul products using a smoking machine and GC with nitrogen-phosphorous detector (GC-NPD). **Results:** We confirmed that nicotine concentrations in liquid in the products from the UK were lower than in the products from the US (17.7±0.4 vs 56.2±1.0 mg/ml, respectively). Products from the UK delivered on average one third of the nicotine yield per puff as US products. Similar flavoring compounds and the same type of nicotine salt (benzoate) were detected in products from two countries. **Conclusions:** Juul products from the US and the UK are generally similar in chemical composition, with the exception of nicotine concentration. Juul products from UK have a decreased nicotine concentration in both the liquid and the emitted aerosol.

FUNDING: Federal

PS1-81

DETECTION AND QUANTIFICATION OF FLAVORING CHEMICALS AND NICOTINE IN WATERPIPE TOBACCO PRODUCTS

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Significance: Waterpipe smokers load their hookah with shisha, flavored tobacco-molasses products which often contain nicotine. Little is known about flavoring chemicals used in shisha and how they transfer to smoke. The aim of this study was to determine the flavoring chemicals present in unburnt and burnt shisha as well as their yields in first-, second-, and third-hand smoke. **Methods:** Eighteen shisha products were chosen based on popularity among online hookah forum users and respondents to the PATH survey. Laboratory-controlled shisha smoking was performed using a Borgwaldt shisha smoker under the Beirut smoking protocol. A modified CORESTA 62 method was used to identify flavoring chemicals in unburnt and burnt shisha. A modified NIOSH 2551 method was used to identify flavorings in first- (Cambridge filters), second- (sorbent tubes), and third-hand smoke (surface wipes). Flavoring identification and quantification of nicotine were performed using Gas Chromatography with Mass Spectrometry (GC-MS). Quantification of flavorings in second-hand smoke and surface wipes was performed using GC with quadrupole time-of-flight mass spectrometry (GC-QTOF-MS). **Results:** Various flavoring chemicals were detected in all analyzed samples except for third-hand smoke. Unburnt and burnt shisha contained an average 8 and 2 flavoring chemicals, respectively. First- and second-hand smoke contained on average 20 and 6 flavoring chemicals or their derivatives, respectively. Some flavorings effectively transferred from the shisha to smoke. Limonene was the only flavoring that was detected in second-hand smoke. Nicotine was detected in all analyzed samples, excluding two tobacco-free products tested. Unburnt shisha contained an average of 1.1 mg/g of nicotine and first-hand smoke contained an average of 0.1 mg of nicotine per one puffing session. **Conclusions:** Smoking shisha products releases nicotine and a significant

number of flavoring chemicals. Waterpipe smokers and bystanders may be exposed to those substances. Future studies are needed to assess potential health consequences of inhaling various flavoring chemicals from shisha products.

FUNDING: Federal

PS1-82

SUBSTANCE USE DISORDER IN MEDICAL EDUCATION - A MULTIDISCIPLINARY APPROACH

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Introduction: Medical schools recognize the need to teach substance use disorder (SUD) treatment skills but struggle with optimal implementation strategies. The University of Cincinnati College of Medicine (UCCOM) devised a standardized clinical experience for medical students (MS) and social work students (SWS) to identify and address SUD in a mock patient encounter. **Methods:** UCCOM and UC Social Work program faculty collaborated with MS on creating a SUD case: a chronic smoker with asthma exacerbation. Students used the screening, brief intervention, and referral to treatment model to uncover the patient's smoking habits and recognize the pattern as SUD. They then provided referrals to appropriate resources based on patient socioeconomic factors. Following the encounter, a 3-question survey was sent out; 37% of MS (n=68) and 100% of SWS (n=20) responded. **Results:** All groups successfully identified and addressed the patient's SUD. By incorporating motivational interviewing (MI) techniques, MS helped the patient link their substance use with physical health problems and encouraged openness to change. SWS used their knowledge of smoking cessation resources to recommend options, accounting for facets of the patient's situation: a partner who smoked, odd work hours, and unreliable transportation. The experience was received well as most students (70%) said it changed their approach to SUD. Common themes in free-text responses: increased confidence in addressing SUD issues and performing MI, greater likelihood of taking a non-judgmental/patient-centered approach, benefits of interprofessional collaboration, and realization of the complexities of SUD and barriers to treatment. **Conclusions:** An interactive learning experience is a highly effective way for medical schools to train students on SUD. By introducing students to the topic early and allowing them to practice addressing it, students will be capable of consistently doing so in the future. This experience also fosters interprofessional collaboration and highlights benefits of a multidisciplinary approach. UCCOM's clinical simulation provides a model that medical schools across the country can adopt.

PS1-83

MENTHOL CONCENTRATION IN STICKS OR HEATED TOBACCO PRODUCT IQOS

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Significance: The tobacco sticks for IQOS device, sold under HEETS brand name, are available in numerous flavors, including menthol. Menthol HEETS sticks are also sold in 'light' and 'strong' flavor options. Since there is a lack of independent research on the chemical composition of HEETS products, the aim of this study was to determine the concentration of menthol in IQOS HEETS products from different countries. We also aimed to compare concentrations of menthol found in HEETS sticks with levels detected in conventional and electronic cigarettes. **Methods:** Menthol IQOS HEETS sticks were purchased from Israel, Poland, South Africa, and South Korea between March 2018 and May 2019. Tobacco plugs were removed from sticks and menthol was extracted with methanol following Coresta Method 92. Menthol concentration were measured using an Agilent 7890/5977B gas chromatograph with mass spectrometry (GC-MS). Determined levels of menthol in HEETS sticks were compared with levels measured in e-cigarette pods (Juul, PHIX, Bo) and conventional tobacco cigarettes (Marlboro Menthol). **Results:** Menthol concentration in the 'light' flavor sticks from Israel, Poland and South Africa were similar, ranging from 0.35 to 0.45 mg per one gram of tobacco (mg/g). These concentrations were similar to that of the mentholated cigarette which contained 0.41 mg/g. Significantly higher levels of menthol were found in 'strong' flavor sticks from Poland and South Korea, ranging from 5.74 to 15.55 mg/g. These levels were similar to those found in e-cigarette pods that contained from 1.57 to 14.71 mg menthol per one milliliter of refill solution (mg/ml). **Conclusions:** Menthol levels in IQOS HEETS sticks vary significantly between 'light' and 'strong' flavor options. Levels found in 'strong' flavor HEETS were at least 10 times higher than conventional tobacco cigarettes and similar to concentrations used in e-cigarette pod products.

FUNDING: Federal



PS1-84

EFFECTS OF CHERRY AND VANILLA FLAVORANTS ON ORAL NICOTINE LIKING AND DISLIKING IN RATS

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Significance: Flavors are widely used in e-cigarettes. The mouth feel of tobacco product smoke or vapor is linked to user satisfaction, and e-cigarette flavors may alter the orosensory properties of nicotine, thereby impacting tobacco product use or abuse potential. Although cherry and vanilla flavorings are popular, the impact of these flavorings on liking and disliking of nicotine is not clarified yet. The hedonic or aversive value of a taste stimulus can be measured in rats using a technique called taste reactivity, which counts affective orofacial expressions. Therefore, we aimed to evaluate the impact of benzaldehyde (cherry flavor) and vanillin (vanilla flavor) on taste reactivity to oral nicotine in rats. **Methods:** Adult Sprague Dawley rats (n = 6-10/ per sex/per group), were implanted with intraoral catheters, allowing for the infusion of small volumes of solutions into the oral cavity. The effects of benzaldehyde (0.01%) and vanillin (0.01%) on the taste responses to nicotine (1-30 µg/ml) were determined in the taste reactivity test. Rats received 20 infusions (250µl/ea) of nicotine with or without flavoring chemicals in separate 45 min sessions. The orofacial movements were captured by a camera and the 6s post-infusion time was scored by an experimenter blind to the testing condition in slow motion. The results were expressed separately as the average of ingestive (hedonic) and the average of aversive responses. **Results:** Nicotine at low concentrations, 1 µg/ml in females and 3 µg/ml in males, elicited ingestive responses compared to water; whereas higher concentrations of nicotine, 10 µg/ml in females and 30 µg/ml in males, elicited aversive reactions. Thus, females were more sensitive to both the rewarding and aversive effects of nicotine. Oral nicotine induces both hedonic and aversive taste responses, which may represent liking and disliking. Benzaldehyde and vanillin increased the hedonic responses of nicotine, as well as to decrease the aversive responses in both males and females. **Conclusion:** These results indicate that benzaldehyde and vanillin may alter the orosensory experience of nicotine, which may influence nicotine's abuse liability in e-cigarette products.

FUNDING: Federal; Academic Institution

PS1-85

TOBACCO USE AND TOBACCO CONTROL POLICIES IN MEXICO. A SECONDARY ANALYSIS OF THE GLOBAL ADULT TOBACCO SURVEY (GATS 2009-2015)

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Significance: Between 2009 to 2015, Mexico increased tobacco taxes, implemented pictorial health warnings on cigarette packages, and enacted smoke-free laws in 11 states covering approximately half of the Mexican population. However, the Framework Convention on Tobacco Control (FCTC) guidelines has not yet fully implemented. This study aims to assess changes in smoking indicators and outcomes in response to tobacco policies in Mexico. **Methods:** Mexico GATS 2009 and 2015 included 28,281 respondents of 15 years and older. Poisson and linear regression models were used to assess changes in 20 key tobacco use and control indicators; current smoking prevalence, cigarettes smoked per day (CPD), secondhand exposure (SHS) in public and private spaces, individual cessation methods, intention to quit, to health warning, exposure to cigarette marketing, price of cigarettes and type of cigarettes purchase. All models were adjusted by age, sex, wealth, urbanicity, and education. **Results:** Prevalence of current smoking did not change between 2009 and 2015 (Adjusted prevalence ratio (APR)=1.06 CI 95%, 0.96-1.16), but there was a reduction in the average CPDs, (from 9.3 to 7.6 CPDs), SHS in bars (APR=0.92 CI 95%, 0.84-0.99), restaurants (APR=0.81 CI 95%, 0.71-0.92), and home (APR=0.68 CI 95%, 0.60-0.78). Additionally, we found an increase in cessation attempts (APR=1.16 CI 95%, 1.07-1.25) and in the proportion of smokers who thought about quitting due to the health warning on cigarette packs (APR=1.32 CI 95%, 1.17-1.49). Advertisement of tobacco products decreased at stores (APR=0.89 CI 95%, 0.84-0.95) but increased online (APR=1.74 CI 95%, 1.51-2.00). Also, there was a decline in the use of medications as a cessation method (APR=0.53 CI 95%, 0.33-0.86). On the other hand, the proportion of smokers who buy single cigarettes (APR=1.31 CI 95%, 1.18-1.47), and the self-reported price of pack cigarettes increased from 52 to 64 Mexican pesos. **Conclusions:** Mexico has made progress in controlling the tobacco epidemic, but challenges remain. To improve

tobacco control, the full implementation of the FCTC will be necessary, including offering effective cessation treatments, increasing tobacco taxes, and enacting a 100% smoke-free law at a national level.

FUNDING: Academic Institution

PS1-86

EXPLORING THE OPPORTUNITIES AND BARRIERS FOR TOBACCO TAX REFORM IN INDONESIA

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Significance. This research provides a pivotal qualitative evidence on Indonesian national tobacco tax policy towards viable policy alternatives: 1) earmark of tobacco tax to Indonesian National Health Insurance and 2) sustainable annual tax increase policy. This evidence can be utilized to inform decision makers for roadblocks as well as opportunities for better tobacco control tax policy. **Methods.** This study builds upon Programmatic Qualitative Research (PQR), in which 15 respondents in government departments, academia and NGOs in Indonesia were identified for their expertise. Interviews were conducted using a structured questionnaire to analyze stakeholders' perception on both of tobacco tax increase and earmark as policy alternatives. Findings were analyzed using a qualitative approach, in which two stage coding, both inductively and deductively, approach was applied. Moreover, framework was developed to address gaps in efforts to sustaining tobacco increase and earmark policies, based on interview results. **Results.** Based on findings, it is found that 80% of respondents agreed that it is important to pass tobacco tax increase policy, however, only 40% respondents responded positively to allocate the tax for national health insurance (earmark). Out of respondents who stated their agreement, 6 out of 15 respondents believe that the percentage of tobacco tax earmarked to states, as a current policy, is not ideal and somewhat arbitrary; and in fact most amounts are unabsorbed every year. In leveraging the policy to increase tobacco tax uniformly and regularly, opportunities identified include national exposure on the health insurance gaps and policy coherence on health. Threats include fundamental differences across stakeholders and lack of political will. Acknowledging the country's unique context with regard to the tobacco industry's influence and forming alliances within the policymaking environment to counter that influence will be important for tobacco control progress in Indonesia. **Conclusions.** Policy engagement have been an issue within the political environment, thus the need to alleviate the problem pertaining to the stalled of policy progress on tobacco tax must be taken. Building consensus and engaging stakeholders on viable alternatives, while acknowledging the context is pivotal to leverage the tobacco tax policy in Indonesia.

FUNDING: Academic Institution

PS1-87

TOBACCO PRODUCT FLAVORS A POLICY REVIEW

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Significance: One aim of the Framework Convention on Tobacco Control (FCTC) is to reduce tobacco product attractiveness. Flavors contribute to tobacco product attractiveness and studies have demonstrated their role in facilitating initiation of tobacco use. We sought to determine which countries are prohibiting flavored tobacco products and the details of those restrictions in order to identify possible gaps and opportunities for these and other countries to address. **Methods:** We reviewed legislation and regulations in the eleven countries and the European Union member states with national tobacco product flavor bans or restrictions. Policies were reviewed for rationale, terms and definitions for flavors, tobacco products covered, flavors included in policy, and the prohibition of flavors on packaging. **Results:** The 12 federations with a tobacco product flavor policy include the United States, Canada, Brazil, Ethiopia, Uganda, Senegal, Niger, Mauritania, EU, Moldova, Turkey and Singapore. Seven of the policies reviewed provided a rationale of dissuading youth uptake of tobacco. Differences between countries include the terms used ('flavors', 'characterizing flavors', 'ingredients', or 'aromatic agents'), with 10 policies using 'flavors' or 'characterizing flavors.' Six policies cover all products made entirely or partly of tobacco leaf. The range of flavors included differ in scope: while countries consistently prohibit flavors associated with fruits and spices, the U.S and Niger exclude menthol, and Mauritania and Uganda do not specify the flavors prohibited in their policies. Eight policies make no specific reference to restricting flavor descriptors on tobacco product packaging, while Canada, the EU, Moldova and Turkey place restrictions on flavor descriptors on tobacco product packaging. **Conclusion:** Countries looking to implement policies restricting flavors in tobacco products can learn from and build on existing comprehensive policies, by restricting flavors in all



tobacco leaf products, prohibiting menthol, and restricting flavor descriptors or images on tobacco product packaging. Future research could examine the implementation and impact of these policies.

FUNDING: Nonprofit grant funding entity

PS1-88

A CUSTOM-BUILT LOW-COST CHAMBER FOR EXPOSING RODENTS TO E-CIGARETTE AEROSOL: PRACTICAL CONSIDERATIONS

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We designed and built a low-cost exposure chamber system for whole-body exposure of rodents to electronic cigarette aerosol. The system can be built with standard laboratory equipment as well as with an open-source electronics platform for e-cigarette control. The system allows varying the air exchange rate, monitoring aerosol levels, and programming arbitrary puff topography. We provide detailed instructions with particular focus on the automated activation of both closed-system ("cigalikes" and "pods") and open-system ("mods") e-cigarettes and the control of a pump used to move the aerosol from the mouthpiece of the e-cigarettes into the chamber. We developed a simple mathematical model for aerosol levels in the exposure chamber that can be used to estimate design parameters such as chamber volume, air exchange rate, as well as puff time and period. Aerosol concentrations observed for different chamber operating conditions (puff time and period, device power output, air exchange rate) were consistent with the mathematical model. Our low-cost exposure system is ideal for use in animal experimental studies on the health effects of e-cigarettes.

FUNDING: Federal

PS1-89

SMOKERS' AND NONSMOKERS' RECEPTIVITY TO SMOKE-FREE AIR POLICIES AND RELATED MESSAGING IN SUPPORT AND OPPOSITION IN ARMENIA AND GEORGIA

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Significance: Public smokefree policies are effective in reducing smoking prevalence and secondhand smoke exposure (SHSe). Armenia and Georgia have high smoking rates in men (>50%), high SHSe rates, and recently proposed or implanted smoke-free legislation, thus warranting research regarding opportunities to promote such policies. **Methods:** In 2018, we surveyed residents (ages 18-64) of 28 cities in Armenia (n=705) and Georgia (n=751) and examined receptivity to smoke-free policies in various settings (1=strongly oppose to 5=strongly support) and persuasiveness of messaging in support or opposition (1=not at all to 4=extremely). **Results:** Participants were an ave. age of 43.4, 60.5% female, 49.0% employed, 72.9% married, and 51.0% parents. Across settings, nonsmokers indicated greater support for smoke-free policies (p's<.05). The greatest support (ave. >4/5) was for policies in healthcare, religious, government, and workplace settings; public transport; schools; and vehicles with children present. The least support (<3/5) was for policies in outdoor areas of bars or restaurants. Support was mixed (3-4/5), and showed pronounced differences in nonsmokers v. smokers (>1 point), regarding indoor areas of bars or restaurants, multiunit housing (common indoor/outdoor areas, individual units), and outdoor public areas (playgrounds, parks, beaches, etc.). Messaging in support of policies was perceived as more persuasive among nonsmokers (p's<.05). The most compelling strategy among nonsmokers and smokers focused on the right to breathe clean air (3.7±0.6 v. 3.4±0.9), followed by the health consequences of SHSe (M±SD: 3.6±0.7 v. 3.1±1.0); the least compelling highlighted no impact on businesses (2.9±1.0 v. 2.5±1.1). The most compelling messaging in opposition focused on using smoking/nonsmoking sections (2.8±1.2 v. 2.8±1.1, p=.610), followed by consumers' responsibility to guard against SHSe (2.4±1.2 v. 2.5±1.2, p=.116); the least compelling was negative impact on businesses (2.1±1.1 v. 2.2±1.1, p=.034). **Conclusions:** Specific settings may present challenges for advancing smoke-free policies. Messaging focusing on individual rights to clean air and health may garner support for such policies.

FUNDING: Federal

PS1-90

DEVELOPMENT OF ZEBRAFISH MODEL FOR SMOKING CESSATION DRUG SCREENING

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Pharmacological screenings of chemical library for compounds that potentially useful as smoking cessation aids utilize murine models that are expensive and time consuming. Therefore, our goal is to operationalize the zebrafish as a cheaper and quicker model for initial screening to identify such compounds. To this end, we started by replicating three zebrafish assays that have been previously identified with quantitative end points that correspond to nicotine responses: 1) the adult zebrafish novel tank test in which acute exposure to nicotine decreases anxiety; 2) the adult conditioned place preference test in which nicotine induces searching behavior in non-preferred environments; and 3) the embryonic sensitization model that demonstrates a heightened response to subsequent exposures to nicotine and desensitization to nicotine with varenicline treatment. Next, we are expanding these assays by optimizing tank substrate, wall color, light levels, and other parameters as well as enhancing the ability to automate data analysis using the Ethovision software which allows more detailed analyses of these assays such as quantifying differences in overall distance moved and time spent at the bottom of the tank as an indicator of anxiety. Ongoing experiments are focused on validating this battery of zebrafish assays by testing compounds known to potentiate nicotinic receptors and to modulate nicotine intake behavior and nicotine withdrawal symptoms in rodents. The development of a quantitative zebrafish model that predict compound's ability to decrease nicotine intake and decrease symptom associated with nicotine withdrawal would facilitate high throughput screening to identify potential smoking cessation agents.

FUNDING: Academic Institution

PS1-91

CHARACTERIZING CIGAR SMOKING WITHIN AFRICAN AMERICAN LOW INCOME COMMUNITIES

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Introduction: African Americans (AAs) represent the largest group of cigar smokers (CS) in the US and are at greater risk of dying from tobacco-related disease relative to Whites. AAs and low income neighborhoods are targeted by tobacco industry marketing strategies. Better understanding of CS characteristics can inform prevention and policy to reduce tobacco-related disparities among this group. **Methods:** Between Nov 2018-Mar 2019, a sample of past 30-day adult smokers of filtered cigar/cigarillos/traditional cigars (n=101) from low income and mainly AA communities in Richmond, VA took an in-person survey assessing demographics, health/tobacco use history, and psychosocial variables. Descriptive statistics were used to profile CS. **Results:** The sample was 62% female and mainly AA (97%). Most reported obtaining high school diploma/GED or less (67%) and had <\$20,000 in annual household income (68%). Almost all used filtered cigars/cigarillos in the past 30 days (96%; M [SD]=15 days [11]) with 16% reporting past 30-day traditional cigar use (M=8 days [7]). The majority of the sample (78%) reported use of at least one other tobacco product, mainly cigarettes (70%). Replacing tobacco in cigar products with cannabis was frequent (40% indicated most/every time). Black & Mild/Game/Swisher Sweets were the most popular cigar brands. Almost half reported past 30-day flavored cigar use with fruit as the top flavor (25%). In terms of purchasing, 60% reported buying packs of 1-2 cigars with more than half spending <\$5/week on cigars (58%). About 25% reported smoking their first cigar within 5 min of waking up; 67% reported interest in quitting within the next 6 months. Only 39% reported receiving cessation advice from a medical professional in the past year. **Discussion:** Findings among this vulnerable population highlight frequent filtered cigar/cigarillo use and tobacco-cannabis co-use, preferences for low cost cigar products sold in singles and pairs, and wide gaps in access to tobacco cessation despite a common desire to quit. Prevention/policy strategies tailored to these characteristics may help address tobacco-related health disparities among low income AA communities.

FUNDING: Federal



PS1-92

DIFFERENTIATION BETWEEN TOBACCO PACKAGES BEFORE AND AFTER IMPLEMENTATION OF STANDARDIZED PACKAGING IN NORWAY. RESULTS FROM A REPEATED CROSS-SECTIONAL SURVEY AMONG YOUTH AGED 16-23

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Objectives A focal goal of marketing is to make a product different from other similar products in ways that matters for the preference of buyers. Package design is important for differentiation, and can influence the experience of the product itself. Norway implemented standardized packaging of tobacco July 1, 2018. The aim of this paper was to study tobacco brand differentiation before and after Norway's implementation of the legislation. **Methods** A repeated cross-sectional survey was conducted, the first wave before and the second after implementation of the policy. Youth aged 16-23 were asked about their perceptions of cigarette and snus packages in general, and showed photos of 4 cigarette and 4 snus brands: in branded version in 2017 and standardized in 2018. Respondents were drawn from a web panel, N=1200 at each time-point (05/2017 and 11/2018). **Results** There was a decline in respondents agreeing that 'some brands have packages that look better than others' (cigarettes: branded 42%, standardized 29%, snus: branded 50%, standardized 28%). Similarly, somewhat fewer respondents agreed that packages 'look like they taste good' (cigarettes: branded 7%, standardized 4%, snus: branded 21%, standardized 14%). Perceptions of the 4 particular cigarette and snus packages differed less in 2018 compared to in 2017: agreeing to the item 'attractive' e.g. varying between 8 and 23% for branded and between 14 and 17% for standardized snus packages. **Conclusion** Youths differentiated less between tobacco packages after implementation of standardized tobacco packaging in Norway, compared to before.

FUNDING: Academic Institution

PS1-93

DENORMALISATION OF SMOKERS IN THE CONTEXT OF AN ENDGAME GOAL. FINDINGS OF THE ITC NEW ZEALAND SURVEY

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Significance Denormalisation (DN) occurs as smoking becomes less socially accepted (e.g. due to falling prevalence and social marketing campaigns) and may increase support for smokefree measures, and smokers' likelihood of trying to quit or quitting. DN may also marginalise smokers and hence could reduce well-being and motivation to quit. Marginalisation may be particularly likely among high prevalence groups (such as Māori, the indigenous peoples of New Zealand (NZ)) who may be targeted by campaigns. We evaluated the experience and impacts of DN among NZ smokers. **Methods** Data were from 726 smokers in Wave 2 (Jul-Dec 2018) of the International Tobacco Control (ITC) NZ Survey. We assessed smokers' perceptions and experiences of smoking, personal and societal marginalisation, impacts of DN in prompting quitting, and negative reactance. **Results** Most smokers (82%) regretted starting to smoke though 80% reported enjoying smoking. A minority reported personal marginalisation: 25% hid smoking from friends and family, 42% felt ashamed and 44% felt disapproval when smoking. Perceived societal DN was more common: 58% agreed smoke-free policies have turned smokers into second class citizens and 76% felt society disapproves of smoking. Most reported having fewer smokers in their social group (59%) or places where they felt comfortable smoking (69%). Negative reactance was rare through personal behaviours e.g. 12% of smokers reported sometimes ignoring smoke-free signs to make a point; but common as a perceived collective attitude e.g. 76% agreed smokers are getting tired of being pressured to stop smoking. DN-related prompts for quitting in the previous 6 months included: societal (39%) and close friends and family's (43%) disapproval of smoking, and setting an example to children (71%). Findings were similar for Maori and non-Maori smokers. **Conclusion** Most NZ smokers hold negative views of smoking and believe society disapproves of smoking. A minority experienced personal DN and personal negative reactance. DN was an important prompt for thoughts about quitting. Monitoring of DN should continue to assess the balance of positive and negative impacts of tobacco control measures.

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PS1-94

A SYSTEMATIC EXAMINATION OF SCHOOL DISTRICT TOBACCO POLICY IN MISSOURI

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Significance: The rapid increase in youth use of electronic smoking devices (e.g., Juul) has created renewed interest in policy to reduce youth access to tobacco and a need to update school policy. Schools are important environments for creating and establishing norms about tobacco use. Several groups have proffered variants of 'model' language with key policy components. This includes defining prohibited products; enforcement and cessation; and policy dissemination. Additionally, prohibition elements related to location (school buildings, vehicles, events), time (e.g., 24/7 everyday) and product use and possession by person (student, staff, visitors). The purpose of this study is to examine public school districts' tobacco policies for core components of model policy language. **Methods:** A critical review of several model policy guidelines led to operationalizing 40 elements of policy. Research staff were trained to review and code policies; each policy was reviewed and coded by two staff to reduce coding discrepancies. All public school districts in Missouri with websites containing policy code were included in the sample. Districts were scored positively by including specified elements in the policy. The highest possible score was: 40. **Results:** Coding of 478 school districts found a mean score of 23.75 (range 2 - 36). 44% had scores of 20 or below; 46% had scores of 21-34; 10% had scores 35 or above. 96% of schools prohibit 'all tobacco products', while 92% specifically mention e-cigarettes. Most frequent components are student tobacco use prohibitions in school buildings (93%), in vehicles (90%), on school grounds (87%), with student possession at 76%. Most frequently absent are 4 items measuring dissemination of policy (72% absent). **Conclusions:** A range of alignment with model policy components was found, although a majority of schools are missing at least 30% of key components. It is likely that some policy components are more essential than others to affect positive change in youth tobacco use. Future study can examine predictors of districts with high and low policy scores as well as investigate the association of comprehensive school policy and youth tobacco use.

FUNDING: State

PS1-95

LOCAL LICENSING TO REGULATE TOBACCO RETAILERS IN CALIFORNIA, A STUDY OF POLICY DIFFUSION OVER TIME AND GEOGRAPHY

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Significance. Local level policy interventions in the retail environment (e.g., flavor bans, location-based restrictions) are increasing rapidly. We examined diffusion of tobacco retailer licensing (TRL) policy in California's cities and counties from the first local license (1992) to 2019. **Methods.** In MonQc, a cloud-based legal coding platform, the municipal TRL ordinances were coded at the date they first became effective and the most recent version to capture change in policy over time; 20% of all coding instances were double coded. A total TRL score (range 0-35.5) and flavor restriction subscore (0-5) were derived. We linked the TRL coding with jurisdiction-level demographic data derived from the American Community Survey (2012-2016) and 2014 jurisdiction-level adult cigarette smoking prevalence from CHIS. Total TRL and flavor scores were modeled via spatial regression implemented in the R package 'nlme' separately at origin, current, and change over time (current minus origin). All models adjusted for spatial autocorrelation. **Results.** Prior to California's state TRL taking effect in 2004, 28 cities and 2 unincorporated counties enacted local TRL. By 2019, 167 of California's 539 jurisdictions (31%) required a local TRL (153 cities/16 unincorporated counties). In 2019, jurisdictions with TRL (n=167) vs without (n=372) tended to be urban (94% vs. 70%), with greater mean population size (122K vs. 48K), greater median household income (\$68K vs. \$66K), a lower percent of non-Hispanic White residents (42.5% vs. 50.5%); and a lower smoking prevalence (12% vs 13%), all p-values < .02. Of the 167 jurisdictions with TRL, 85 (51%) had updated them over time. TRL origin and current scores strengthened with time (p < .001). TRL total and flavor scores were higher for the San Francisco Bay Area and Los Angeles relative to other areas, and the Bay Area had the greatest score increases over time. **Conclusion.** The findings support a pattern of diffusion in TRL policies in California's cities and counties. Over time and in focal geographies, TRL scores strengthened. The Bay Area,



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in particular, has been a leading region for TRL policies and specifically for flavor bans.
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FUNDING: State

PS1-96

SMOKERS' AND NONSMOKERS' SECONDHAND SMOKE EXPERIENCES AND INTERACTIONS TO REDUCE EXPOSURE

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Significance: Armenia (AM) and Georgia (GE) have high tobacco use rates (51.5% and 59.2% in men; 1.8% and 7.3% in women, respectively) and high rates of secondhand smoke exposure (SHSe). Given recent efforts to implement smoke-free legislation in these countries, this study examined smokers' and nonsmokers' experiences with and interactions regarding SHSe. **Methods:** Surveys were conducted in 28 communities in AM (n=705) and GE (n=751) in 2018 and assessed SHSe and smoking in different contexts in the last 30 days, as well as attitudes toward and interactions regarding SHSe. **Results:** Overall, mean age was 43.4 years (SD=13.5), 60.5% were female, and 27.3% were smokers. Smokers and nonsmokers reported similar experiences related to places where smoking and SHSe occurred in various contexts. SHSe among nonsmokers was most common in homes (42.7%), cars (42.4%), and outdoor public places (38.2%); these places were also where smokers mostly commonly reported smoking (70.0%, 62.1%, and 60.0%, respectively). When asked about specific places where nonsmokers saw smoking and smokers reported smoking, the top three sites included others' homes (77.0% vs. 71.0%) and cars (67.9% vs. 73.4%), as well as beaches, parks and playgrounds (67.0% vs. 56.6%). Smokers were more likely to put out a cigarette if asked and nonsmokers were more likely to ask someone smoking to put out a cigarette in places where smoking was prohibited vs. where allowed (76.5% vs. 57.3% and 46.6% vs. 30.7%, respectively). Moreover, 89.9% of smokers indicated being very likely to put out their cigarettes if asked when small children were present. Nearly two-thirds had never seen someone ask another to put out a cigarette, and 76.7% of smokers had never been asked to do so. However, 75.8% of smokers indicated making at least some efforts to minimize SHSe among nonsmokers. **Conclusions:** The study results demonstrated high levels of SHSe and differential attitudes of smokers and nonsmokers regarding interactions to reduce SHSe depending on the smoke-free policy in public places. These findings indicate an urgent need for smoke-free policy improvement and/or proper enforcement of such policies.

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PS1-97

A LONGITUDINAL STUDY OF THE EFFECT OF A FRUIT-FLAVORANT ON NICOTINE PREFERENCE AND CONSUMPTION IN MICE.

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Significance: E-cigarettes (e-cigs) are popular across age groups, with approximately 9 million adults and 3.6 million school-aged students using these products. A hallmark feature of e-cigs is the availability of non-traditional flavorants (e.g. fruit, candy, alcohol). Flavored e-cigarettes are commonly used to initiate nicotine use in adolescence or to attempt nicotine cessation in adulthood. We developed a longitudinal animal model that mimics the life of a "vaper", in which mice initiate nicotine use in adolescence and continue into adulthood. Using this model, we can study the effect of a fruit-flavorant on nicotine consumption and preference introduced either in adolescence or in adulthood. **Methods:** Male and female C57BL/6J mice were tested in a 2-bottle choice paradigm that involves three phases: (1) mice initiate nicotine use in adolescence with either unflavored nicotine or flavored-nicotine, (2) throughout young adulthood all mice receive unflavored nicotine in the 2-bottle choice test, (3) flavor is then either introduced for the first time or re-introduced into the nicotine bottle in adulthood. **Results:** Adolescent mice preferred a fruit-flavored nicotine solution over an unflavored solution during adolescence. In addition, adolescent mice with access to flavored-nicotine consumed higher daily doses of nicotine than those with access to unflavored nicotine. Adult mice exposed to flavored-nicotine for the first time in adulthood maintained their baseline nicotine consumption despite the addition of flavorants to the nicotine bottle, while mice

that were re-introduced to flavored-nicotine in adulthood significantly increased their nicotine consumption. **Conclusion:** Our data in adolescent mice recapitulate clinical data which have shown (1) a higher preference for and (2) increased consumption of flavored nicotine compared to unflavored or tobacco-flavored nicotine. In addition, our data suggest that for adolescents currently using a flavored tobacco product, avoiding previously nicotine-paired flavorants could be a key element to their success in future nicotine cessation attempts.

FUNDING: Federal

PS1-98

THE AVAILABILITY AND MARKETING OF E-CIGARETTE PRODUCTS PRE AND POST LEGALIZATION OF NICOTINE CONTAINING E-CIGARETTES IN CANADA

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Significance: Prior to the legalization of nicotine containing e-cigarettes in Ontario, Canada, the availability and marketing of any e-cigarette products was limited. Pre-legalization, vape shops were the most prominent locus of marketing. Since legalization, there has been an increase in the availability and marketing of nicotine containing e-cigarette products. We sought to explore the changes in availability and marketing of these products pre and post legislation to examine the effects of these policies. **Methods:** We conducted structured retail observations in September 2017 and July 2019 (51 stores pre legislation and 64 stores post legislation) on the availability and marketing of e-cigarette products in five cities in Ontario, Canada. Observations were made in four store types where e-cigarette products were readily available: convenience stores, head shops, tobacconists, and vape shops. The same stores were visited pre and post legislation where possible, with additional convenience stores added post legislation. **Results:** Before legalization, nicotine and non-nicotine e-cigarette products were available (none with nicotine salts) in 82% of stores (62.5% convenience stores, 66.7% head shops, 80% tobacconists, and 100% vape shops). One-third of convenience stores had e-cigarette products with nicotine. Promotion and advertising were typically limited to the interior of vape shops. This has drastically changed since nicotine legalization. Almost all stores (97% of all stores, 100% convenience stores, 66.7% head shops, 100% tobacconists, and 100% vape shops) now carry e-cigarettes products. This change is most visible in the sampled convenience stores, which now all carry nicotine salt e-cigarette products. Overt advertising on storefronts sampled has also increased, with exterior advertising on 73% of convenience, 50% of tobacconists, and 33% of vape shops. **Conclusions:** Before legalization, a range of e-cigarette products and nicotine concentrations were available in Ontario, with advertising typically limited to specialty vape shop interiors. The most visible change since legalization has been in convenience stores, which now all have nicotine salt devices available, and most have some form of advertising. This is an alarming increase in both availability and promotion. Where pre legislation advertising was typically only found in interiors of a few hundred vape shops, post legislation advertising has potentially increased reach to 10,000's of convenience stores, with both interior and exterior advertising.

FUNDING: Other

PS1-99

THE SMOKELESS TOBACCO OLYMPICS: THE US TOBACCO COMPANY, THE IOC, AND THE 1980 LAKE PLACID OLYMPIC WINTER GAMES

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Throughout much of the twentieth century, cigarette manufacturers have sponsored sporting events and used sports figures in advertising and marketing their products. The United States Tobacco Company (UST) became a sponsor of the 1980 Winter Olympic Games in Lake Placid, New York, allowing the company to place the Olympic emblem on their television and print advertisements and on product packages. At the time, UST was seeking to expand the market for smokeless tobacco products, experimenting with new products and portraying their products as an alternative to smoking. At the same time, commercial sponsorship was becoming increasingly important to the future of the Games. However, this was to be the last time a tobacco company was named an official sponsor of the Olympic Games. This paper reviews the history of UST's 1980 Olympic sponsorship using records from the IOC, the Lake Placid organizing committee, and internal tobacco industry documents. The episode generated substantial discussion and concern within the International Olympic Committee (IOC) about tobacco sponsorship,



though the IOC had limited power to impose restrictions on sponsorship. While the Olympic Games have since been declared “smokefree”, the implementation of this goal is incomplete. There remains no comprehensive policy today regarding tobacco advertising and sponsorship associated with the Olympics.

PS1-100

SUPPORT FOR THE HOUSING AND URBAN DEVELOPMENT'S SMOKEFREE RULE IN THE DISTRICT OF COLUMBIA HOUSING AUTHORITY

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Significance: In August 2018, the U.S. Department of Housing and Urban Development (HUD) required all public housing properties in the US to be smokefree. This rule prohibits lit tobacco products in all living units, common areas, administrative office buildings, and outdoor areas up to 25 feet in all public housing facilities. While several studies have examined support for smokefree rules in public housing, these rules were implemented voluntarily by the examined public housing authorities. To our knowledge, this is the first study examining support for the smokefree rule mandated by HUD. **Methods:** Data from 375 District of Columbia Housing Authority residents aged 18-80 from 10 properties were analyzed. Data were collected from July 2018 to July 2019 and include smokers (n=237) and non-smokers (n=138), and participants from family (n=171) and senior/disabled housing communities (n=204). Participants indicated support for the rule by indicating that smoking should not be allowed in resident units, balconies, and within 25 feet of housing authority buildings. Frequencies and crosstabs were conducted to assess support for the rule and to identify potential differences between smokers and non-smokers, and residents of family and senior/disabled communities. **Results:** The majority of residents indicated that smoking should not be allowed in resident units (71.1%), balconies (75.7%), and within 25 feet of public housing authority buildings (66.5%). Non-smokers, compared to smokers, were more likely to indicate that smoking should not be allowed in resident units (84.6% vs. 63.0%; chi square=18.52, p<.0001) and balconies (86.9% vs. 69.0%; chi square 14.21, p<.001). No differences were observed between smokers and nonsmokers for within 25 feet of public housing authority buildings. Support for all locations was similar between residents in family and senior/disabled buildings. **Conclusions:** Despite the mandatory nature of the rule, the majority of residents indicated support for the rule. The findings are consistent with previous research showing greater support among nonsmokers, but the majority smokers also support the HUD rule in the District of Columbia Housing Authority.

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PS1-101

YOUTUBE VIDEOS ON E-CIGARETTES AND E-CIGARETTE MARKETING

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INTRODUCTION: YouTube is a popular website that youth use to obtain information about e-cigarettes. Thus, it is important to understand the content of e-cigarettes in YouTube videos and the marketing sources of these videos. We assessed YouTube videos to identify their marketing sources and themes related to e-cigarettes. **METHODS:** Using a browser plug-in and custom scripted crawling, we searched for vaping on YouTube in 2019 and requested 500 videos. We examined videos that were in English, featured an e-cigarette/e-liquid in the video, were ≤ 10 minutes in duration, and had > 500 views. Human coders coded the video themes and their sources. **RESULTS:** 213 videos met the inclusion criteria. The video themes were vape tricks (16.0%), product reviews (15.5%), modified use of e-cigarettes (13.6%), informational (11.3%), tutorials on how to use an e-cigarette (9.9%), testimonials (9.9%), mockery videos of e-cigarettes (9.4%), health information (5.6%), news clips (5.2%), and other (3.8%). 42.3% of the videos were industry sponsored. Industry sponsored videos were more common than non-industry sponsored videos for the following themes: product review (22.2% vs. 10.6%), tutorial (15.6% vs. 5.7%), and informational videos (20.0% vs. 4.9%), $\chi^2 = 40.77$, p <.001. The video sources included: 27.1% online shop, 25.6% non-sponsored vape enthusiast, 12.6% non-vape related influencer, 11.6% other, 6.3% news organization, 5.8% e-liquid company, 5.3% sponsored vape enthusiast, 2.9% health organization, and 2.9% vape shop. Non-sponsored videos had more views, likes, and dislikes than sponsored videos (all p <.0001; med views for all included videos = 774,504). **CON-**

CLUSIONS: E-cigarettes are promoted in YouTube videos by both industry-sponsored and non-industry sponsored sources. Our findings indicate the need for strict restrictions to prevent industry-sponsored videos to market their e-cigarette products on YouTube.

FUNDING: Federal; Academic Institution

PS1-102

SEEKING RESULTS IN THAILAND HOW TO ACHIEVE ENFORCEMENT SUCCESS OF SMOKEFREE LAWS

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Introduction: Thailand has smoke-free laws which cover all indoor settings as well as some outdoor spaces like parks and transportation stops. However, when there is no awareness of the law and inadequate inspections and penalties to support it, compliance is often poor. Rather than focus on the problems of enforcement, we identified and focused on one person's successful process to get results. **Method:** Tobacco control experts identified a government health worker, Loong Joon, who started to vigorously document and complain to the police about many violations of the smoke-free law in government controlled facilities like hospitals and community health centers, government buildings, and government parks. We used qualitative interviews recorded over two days to get information about his experience and success filing 4,622 complaints of violations of the smoke-free law with police throughout Thailand. **Results:** We found that Loong Joon had performed his government role educating people about the smoke-free law. He found that this approach was not successful without authorities monitoring and punishing those who did not follow the smoking ban. He set about monitoring, picture documenting and presenting written complaints to the police of violations in government places where the police had enforcement responsibility. He found mixed results depending on the region of Thailand and how the police and other government administrators viewed his attempts to attain compliance with the law. **Conclusion:** Thailand, and other LMIC, may find utility in Loong Joon's approach. It sets aside the usual excuses of not enough regulation, money or support. It takes the clear provisions in the law and makes them meaningful to those responsible for their government places being smoke-free. He shows that success is possible if individuals take action to spotlight obvious irresponsibility towards duties of care.

FUNDING: Federal

PS1-104

GENETIC INFLUENCES ON LEARNING, ACETYLCHOLINESTERASE, AND WITHDRAWAL FROM CHRONIC NICOTINE ACROSS INBRED MOUSE STRAINS

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Significance Nicotine is a modulator of the cholinergic system with potent addictive properties. Nicotine withdrawal is known to produce cognitive deficits in both human populations (Ward et al., 2001) and animal models (Portugal & Gould, 2009). In human populations, genetic variation modulates the effects of nicotine on cognition. **Methods** In order to model effects of nicotine withdrawal on learning and cholinergic signaling in a genetically diverse population, we tested hippocampal contextual fear learning and acetylcholinesterase activity following withdrawal from chronic nicotine in a panel of 20 male inbred mouse strains. **Results** We found significant strain variation in both baseline contextual learning as well as in the impacts of nicotine withdrawal on learning. Given that nicotine's effects on learning are mediated by hippocampal cholinergic activity, we also investigated synaptic enzyme acetylcholinesterase (AChE) activity in the dorsal hippocampus of the tested mouse strains. Although significant strain differences in AChE activity were found in saline treated mice, no clear effect of nicotine on AChE activity was observed. Saline group contextual fear learning was significantly correlated with saline group dorsal hippocampal AChE activity, whereas no association between nicotine-evoked changes in contextual fear learning and dorsal hippocampal AChE activity were found. Due to variation in baseline AChE activity between strains, follow-up gene expression correlations were conducted via publicly available data. In the tested strains overlapping with those in the public database, no correlation between AChE activity and AChE gene expression were found. **Conclusions** These results suggest that enzymatic degradation of acetylcholine in the hippocampus modulates fear memory dynamics



but does not play a role in nicotine induced learning impairments. Moreover, baseline AChE activity variation across inbred mouse strains is most likely facilitated through mechanisms independent of AChE gene expression.

FUNDING: Federal

PS1-105

LAWMAKERS' ATTITUDES TOWARD TOBACCO CONTROL LAWS AND TOBACCO INDUSTRY INTERFERENCE IN LAWMAKING AFTER EXPOSURE TO COURT-ORDERED CORRECTIVE STATEMENTS

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Significance: The tobacco industry influences public policy, often capitalizing on the general pro-business and anti-regulation positions of lawmakers with conservative political leanings (CPL). After violating federal racketeering laws, tobacco companies began publishing court-ordered corrective statements (CS) as newspaper and television ads in November 2017 and as cigarette pack inserts in November 2018. The 20-year-old court case remains active, with tobacco companies still fighting a court order that would require posting of CS at retail points-of-sale. This is the first study to examine state and local lawmakers' attitudes toward current or proposed tobacco control laws or tobacco industry interference (TII) in lawmaking after exposure to the CS and related court findings (CF). **Methods:** All state legislators (n = 7,327) from the 50 US states and all council members (n = 3,930) from the 456 US cities with populations >75,000 were invited by email to take an online survey in May and June of 2018, after publication of the CS had begun. A total of 436 lawmakers (195 state and 241 local) completed the survey. After reading the CS and CF, participants reported their attitudes toward 14 current or proposed tobacco control laws, 7 examples of TII in lawmaking, and several related issues. Political leanings (conservative, moderate, and liberal) were measured using two seven-point scales (fiscal and social) and dichotomized into CPL (n=258) vs. no CPL (n=178) for use in regression modeling. Calibration weighting was used to reduce nonresponse bias. **Results:** After adjusting for elected official type and years of service, CPL were associated with significant differences for all laws and examples of TII surveyed. However, most lawmakers with CPL favored 11 of the 14 laws surveyed, as compared to 14 of 14 for those without CPL. Similarly, most lawmakers with CPL disapproved of 5 of the 7 examples of TII surveyed, as compared to 6 of the 7 examples for those without CPL. While actual effects of exposure to the CS and CF could not be determined, most lawmakers - either with CPL (59.9%) or with no CPL (82.0%) - reported that they were more likely to "support the adoption of stronger tobacco-related laws after being exposed to the corrective statements and related court findings." **Conclusions:** This study suggests that while CPL is negatively associated with lawmakers' attitudes toward tobacco control laws and TII in lawmaking, most conservative-leaning lawmakers' post-exposure attitudes align with those of most other lawmakers on these critical public health issues.

FUNDING: State; Academic Institution

PS1-106

STRAIN AND SEX DIFFERENCES IN NICOTINE SELF-ADMINISTRATION ACQUISITION

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Preclinical studies of nicotine use provide important value for the field as they are highly rigorous, controlled, can be conducted quickly, and are generalizable to humans. Given the translational value of the nicotine self-administration model, as well as the new guidelines of the National Institutes of Health to include sex as a biological variable, strain and sex differences in nicotine acquisition were examined here in two outbred rat strains. Sprague-Dawley and Long Evans rats of each sex (n=12 male, 18 female and 10 male, 7 female, respectively) were implanted with intravenous jugular catheters. Following recovery, rats were trained to self-administer nicotine (0.02 mg/kg/infusion, paired with contingent light+tone conditioned cues) for a minimum of 10 sessions. This dose of nicotine was chosen as it is on the ascending limb and near the peak of the dose-response curve. Acquisition criteria were set at a minimum ratio of 2:1 lever presses (active:inactive) and a minimum of 10 infusions per session. Male Sprague-Dawley rats self-administered significantly more nicotine than female Sprague-Dawley rats ($p < 0.01$), indicating a sex difference in this strain. As well, there was a trend indicating that male Sprague-Dawley rats self-administered more nicotine infusions than Long Evans males

($p = 0.09$), indicative of a potential strain difference between males. In further support, Sprague-Dawley males had an increase in active lever pressing across sessions compared to Long Evans males, indicating a strain difference in rate of acquisition in males across sessions ($p < 0.001$). Long Evans females self-administered significantly more nicotine than Sprague-Dawley females ($p < 0.001$) and Long Evans males ($p < 0.01$). Although intake differed significantly between groups, there were no strain differences in number of sessions to criteria or number of infusions when collapsed across sex. Together, these results indicate that male Sprague-Dawley and female Long Evans rats self-administer more nicotine at the 0.02 mg/kg/infusion dose compared to the other strains/sexes. Further, all strains met acquisition criteria within 20 sessions, indicating that males and females from either strain learn to self-administer nicotine. These results have important implications for the development of other models of nicotine self-administration, such as aerosolized nicotine, as strain or sex may impact acquisition in other models. As well, these results may have important implications for neuroscience endpoints that depend on amount of nicotine exposure.

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PS1-107

TRANSITIONS IN YOUTH AND YOUNG ADULT E-CIGARETTE USE: A PROSPECTIVE STUDY

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Significance: The prevalence and uptake of youth and young adult e-cigarette use has been escalating at an alarming rate. Little is known about changes in youth and young adult e-cigarette use patterns over time. We assess the stability of youth and young adult e-cigarette use status using a 12-month prospective study. **Methods:** In March 2018, we recruited 1048 Canadian youth and young adults (16-25 years of age) using social media platforms. Quota sampling ensured that 60% of the total sample were regular e-cigarette users who used at least weekly. Participants were invited to answer detailed online surveys about e-cigarettes (vaping) and other behaviors at the time of recruitment and 12-months follow-up. We conducted bivariate analyses on e-cigarette use at baseline and 12-month follow-up for the 663 participants who responded to both surveys (retention rate=63%). **Results:** At baseline, participants had a mean age of 18 years; 62% were male and 14% were current cigarette smokers. Among regular e-cigarette users at baseline, more than 4 in 5 (82%) were regular e-cigarette users at 12-months follow-up; less than 5% of regular users were no longer using e-cigarettes, and the remaining 13% were now using a little less frequently. Among never e-cigarette users at baseline, more than 40% had tried e-cigarettes at the 12-month follow-up, with 5% now using e-cigarettes regularly. Among the baseline non-regular e-cigarette users (using less than weekly), 35% were now using e-cigarettes regularly. **Conclusion:** At follow-up, regular youth and young adult e-cigarette users by and large continued to use e-cigarettes on a regular basis suggesting that they may continue as regular users in the long-term. For others, there is a definitive trend to initiate and increase e-cigarette use. Given the potential health-related harms of using e-cigarettes, and that only a small minority of participants smoked combustible cigarettes at baseline, research, policy and practice should focus on better understanding and implementing policies and interventions to address long-term e-cigarette use by youth and young adults.

FUNDING: Other

PS1-108

SPATIAL ANALYSIS OF TOBACCO, VAPE AND CANNABIS RETAILERS

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Significance: There is growing concern that cannabis retailers, especially unlicensed cannabis retailers, are establishing storefronts in communities that tend to have high tobacco and vaping retailer densities. However, there is a lack of research examining the spatial relationship between tobacco retailers, vape shops, and cannabis retailers to identify communities with disproportionate levels of tobacco, vape, and cannabis product availability and marketing exposure. This study will address this gap by using spatial analysis techniques to examine the clustering of tobacco, vape and cannabis retailers in the Los Angeles area. Given that tobacco and vape shop density was found to be higher among lower-income communities, it is hypothesized that retailer clustering will be more common among lower-income communities. **Methods:** Tobacco, vape (licensed and unlicensed) and cannabis retailers (licensed and unlicensed) located in the Los Angeles area are currently being identified using lists provided by state and city government-



tal agencies, online directories and social media sites. Addresses will be verified and geocoded and point pattern spatial analysis techniques will be used to test whether the retailer data exhibits any clustering patterns. U.S. Census information will then be used to explore the sociodemographic and economic characteristics of areas identified as having statistically significant clustering patterns. In addition, we will examine the density of licensed versus unlicensed retailers and examine community characteristics of areas identified as having clusters of unlicensed retailers. Results: Initial results from the analysis will be presented and analytic issues discussed. Conclusions: A study that examines the cumulative impact of tobacco, e-cigarettes, and cannabis availability is an important public health priority, however, it is currently unknown whether the distribution of these three retailer types may be clustered. Findings can be used to inform future surveillance, public health campaigns and policy regarding tobacco and cannabis retailer zoning laws, retailer regulations and marketing practices.

FUNDING: State

PS1-109

FREE RADICAL PRODUCTION AND CHARACTERIZATION OF HEAT NOT BURN CIGARETTES

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Background: As conventional cigarettes burn, the tobacco reaches temperatures of over 900°C resulting in the production of a number of toxicants as well as significant levels of highly reactive free radicals. In attempts to eliminate combustion while still delivering nicotine a newer alternative tobacco product has emerged known as “heat-not-burn” (HnB). These products heat tobacco to temperatures of 250-350°C depending on the device. This allows for nicotine and flavoring to volatilize while limiting some of the toxicant production that occurs at higher temperatures. These devices come in a variety of different designs: The recently FDA-approved iQOS utilizes a heated blade that is inserted into a small tobacco plug; Kent Glo utilizes a heated chamber to heat a thin tobacco stick; and Ploom, a hybrid product, combines an e-cigarette with nicotine-free eliquid with a plug of powdered tobacco at the mouthpiece. Since free radicals represent an important class of toxicant produced from tobacco-related products, we sought to test and characterize these new devices, in comparison to conventional cigarettes and different styles of electronic cigarettes, as to their free radical production.

Methods: Since free radicals represent an important class of toxicant produced from tobacco-related products, we sought to test and characterize these new devices, in comparison to conventional cigarettes and different styles of electronic cigarettes, as to their free radical production. Highly reactive free radicals were collected using the spin trap PBN and resulting radical adducts were analyzed and quantitated by electron paramagnetic resonance spectroscopy (EPR).

Results: The HnB products produced >98% fewer radicals than the 3R4F research cigarette (3R4F: 6.2 ± 0.8 nmol/cig; iQOS: 151.6 ± 13.0 pmol/stick; Glo: 87.2 ± 2.22 pmol/stick; Ploom: 121.4 ± 13.6 pmol/10 puffs), >80% fewer radicals than larger e-cigarette devices (Box Mod: 477.6 ± 18.4 pmol/10 puffs; SREC e-cigarette: 408.0 ± 16.0 pmol/10 puffs) and slightly higher levels as compared to the Juul (52.7 ± 5.3 pmol/10 puffs). Particulate radicals were only detected in the research cigarette (813.0 ± 8.7 pmol/cigarette).

Conclusions: While HnB products have been shown by others to produce aldehydes and some other toxic components, it appears that their design features allow for substantially lower the free radical delivery when compared to a conventional cigarette and some higher powered e-cigarettes.

FUNDING: Federal

PS1-110

MEASURING SUPPORT FOR REQUIRING REDUCED NICOTINE CIGARETTES, ISSUES WITH QUESTIONS, ANSWERS, AND RESPONDENTS

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INTRODUCTION: The FDA may reduce nicotine levels in cigarettes, as long as it is not to zero. Several studies have asked the public about their support for requiring only very low nicotine cigarettes (VLNC) to be sold, but ‘support’ is often influenced by the wording of questions and answer options. This study examined support for VLNC proposals using two Likert-type questions, a forced-choice question providing a range of VLNC policy options, and a latent variable of VLNC support. **METHODS:** A cross-sectional survey recruited 540 U.S. adults using TurkPrime. Participants randomly received one of two Likert-type questions (standard/precise wording) about support for VLNC, with the order of response options randomized. Participants

then received a forced-choice question on support for a range of VLNC policy options. Generalized linear models examined correlates with a latent variable of VLNC support. **RESULTS:** There was a significant order effect for the Likert-type question such that support for VLNC was significantly higher when ‘support’ options were presented first ($t = -4.52$; $p < .001$). As such, analyses control for this effect. In exploring the concordance between the Likert-type and forced-choice question, there were notable differences by smoking status. A minority of smokers (21.1% (95% CI: ± 7.8)) supported the policy on both questions, compared to 47.8% (95% CI: ± 10.3) of former and 52.2% (95% CI: ± 6.2) of never smokers. In the latent model, current smokers were significantly less likely to support VLNC compared to never smokers. Order of response options was also a significant predictor. **CONCLUSIONS:** Survey design, including question type and the order in which response options are presented, resulted in a substantial difference in participant responses, which have significant policy implications. Better and multiple questions are needed before the FDA draws conclusions about support for VLNC, especially among smokers. Biases arising from the order of answer options given need to be considered. The public seems as interested in adding VLNC as an optional product as they do in it being the only legal cigarette on the market.

FUNDING: Academic Institution

PS1-111

UNDERSTANDING THE ASSOCIATION BETWEEN POD-STYLE ELECTRONIC CIGARETTE AEROSOL EMISSIONS AND USER TOPOGRAPHY BEHAVIOR

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Significance: There is a lack of consensus regarding metrics for reporting e-cigarette emissions. The Total Particulate Mass (TPM) concentration of aerosol emissions is dependent upon both user topography (puff flow rate and duration) and e-cigarette/e-liquid product characteristics. **Methods:** Laboratory emissions testing was conducted with the PES-1 emissions system on JUUL and Vuse Alto brand pod-style electronic cigarettes using manufacturer’s standard refill pods, at a declination angle of 30 degrees below the horizontal, reflecting typical use orientation observed on social media. Multiple devices were studied to assess manufacturing variability. Repeated trials of flow conditions spanning each device operating range of puff flow rates and durations, including the CORESTA recommended condition of 18.33 [mL/s] puff flow rate and 3 [s] duration, were conducted to capture TPM and nicotine emissions using filter pads. Gravimetric and GC-MS analyses were conducted to evaluate the yield of TPM and nicotine for each condition. **Results:** The puff flow rate required to activate the auto-on coil of each Electronic Nicotine Delivery System (ENDS) is nominally 15 and 17 [mL/s] for JUUL and Vuse Alto, respectively. The onset flow rate at which e-liquid was aspirated into the flow stream is nominally 25 and 29 [mL/s] for JUUL and Vuse Alto, respectively. TPM yield correlates well with e-liquid consumed (ICC > 0.95). The nicotine concentration, C_{NIC} [mg/mL], is defined as the product of the TPM concentration, C_{TPM} [mg/mL], and the mass ratio of nicotine, f_{NIC} [mg/mg], present in the aerosol. TPM concentration varies significantly as a function of flow rate and is relatively independent of puff duration for the products tested, while nicotine mass ratio is a weak function of flow conditions. **Conclusions:** Findings may inform standardized testing and reporting processes for e-cigarette emissions and provide a quantitative and statistically rigorous protocol to establish or reject a hypothesis of substantial equivalence between novel and predicate ENDS. E-liquid aspiration exhibits onset at puff flow rates which are ENDS design dependent, but well within the range of puff topography behavior previously reported in natural environment observation studies.

FUNDING: Federal; Academic Institution

PS1-112

MENTHOL CIGARETTE PRICE DISPARITIES AMONG TOBACCO RETAILERS IN BAY AREA NEIGHBORHOODS

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SIGNIFICANCE: Young adults smoke cigarettes at higher rates than any other age group and are disproportionately more likely to smoke menthol cigarettes. Black, Latino and female young adults are particularly at risk for smoking menthol. Menthol smokers tend to rate menthol cigarettes as safer than regular cigarettes and have more difficulty quitting. To address these disparities, and the appeal of flavored tobacco to



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young people, several cities in California have recently passed sales bans on flavored tobacco. However, these policies vary and some exempt menthol from the definition of flavors. This study aims to evaluate menthol price differences across tobacco retailers in the Bay Area in the context of neighborhood context and composition. **METHODS:** We used data we collected in 2015 from selected tobacco retailers (N=225) in 142 Census block groups in Alameda & San Francisco Counties. We additionally conducted audits of each of these block groups to assess a variety of observed features, such as markers of disorder, and street and housing maintenance. We linked these data to 2011-2015 American Community Survey data to ascertain block group demographic characteristics. We performed two OLS regressions, first evaluating associations between our neighborhood observational data and Newport pack price by block group, followed by analysis of pack price in relation to block group demographic characteristics. **RESULTS:** Newport pack price was inversely related to neighborhood disorder (litter, graffiti, vacancy) (-0.67, CI: [-1.1, -0.23]) and the concentration of Black residents (-1.5, CI: [-2.4, -0.64]). Alternatively, pack price was higher in neighborhoods noted for attractive features and architecture (0.26, CI: [0.04, 0.49]), and in which residents had a higher average level of education (1.3, CI: [0.41, 2.3]). **CONCLUSION:** Menthol prices were lower in neighborhoods that were deemed objectively less attractive and more disordered, as well as in neighborhoods with lower educational attainment and a higher concentration of Black residents. Cities in the Bay Area that include menthol in their flavored tobacco sales restrictions have the opportunity to mitigate this disparity.

FUNDING: Federal

PS1-113

KNOWLEDGE, ATTITUDE AND PERCEPTION OF MEDICAL STUDENTS IN CAMBODIA TOWARD NO SMOKING IN PUBLIC PLACES POLICY (NSPPP)

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Background: Ban on public smoking has been approved in Cambodia. Our study aimed at assessing knowledge, attitude and perception of medical students which are one of the key stakeholders of tomorrow's health system toward NSPPP in Cambodia. **Method:** A cross sectional survey of Medical students was carried out with data collected using a structured online questionnaire. The information collected was related to knowledge, attitude and perception toward NSPPP by respondents. The data obtained was analyzed using descriptive statistics. **Results:** A total of 50 participants consisting of medical students took part in the survey. Majority (75%, n=36) were familiar with the policy with a significant number (85%, n=39) indicating that the existing laws for tobacco in Cambodia are still inadequate. Up to 96% (n= 47) think that it is unacceptable for people to smoke in public places. Respondents admitted that they still see fairly good amount of people (40%, n=19) smoke in the public places. A large majority (98%, n=47) state that all indoor and enclosed spaces should be smoke free and show great concern that secondary smoke would affect children and pregnant women. In the past two years, they responded that the NSPPP sign is rarely (55%, n=27) seen being displayed with the majority of them (90%, n=44) pointing out to no media propagation and lack of enforcement leading to the non-awareness. **Conclusion:** A significant number of the medical students are aware of the policy but vast majority still believe the enforcement of the law is inadequate. The use of media is underutilized and most people are not aware of the policy due to that reason.

FUNDING: Unfunded

PS1-115

CHARACTERIZATION AND VALIDATION OF GENERATION TWO WPUM™ FAMILY OF TOPOGRAPHY MONITORS

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Significance: Observation of real use topography should be used to inform realistic machine puffing protocols and conduct meaningful risk assessment of inhaled tobacco products, particularly those products meant to reduce harm. Various techniques have been used to observe topography behavior (video recordings, hand gestures, topography monitors, etc.), though studies have rarely attempted to objectively quantify topography in the natural environment. Additionally, commercial topography monitors are reported to have limitations with respect to repeatability, reliability and the amount of time and puffs that can be recorded. **Methods:** A family of topography monitors is introduced, characterized and validated both in-lab and in the natural environment. Four configurations of wPUM™ 2nd generation topography monitors (cigarette, cig-a-like, vape-pen, and waterpipe) were exposed to different puffing profiles, each designed to assess the

monitor's measurement accuracy, range and sensitivity for puff flow rate, duration, and interpuff interval. Repeatability was measured in-lab with machine puffing and in the natural environment with actual users by assessing changes in the calibration curves prior to and following each in-lab machine puffing session and each natural environment deployment. Pearson's correlation coefficient and the Intraclass Correlation Coefficient (ICC_{1,1}) were determined for each monitor based on the pre/post calibration test conditions. **Results:** The range, sensitivity, accuracy, and repeatability of each monitor configuration are presented. All monitor configurations were demonstrated to exhibit exceptional repeatability of $r > .99$, $ICC_{1,1} > .99$ in a laboratory setting with machine puffing. Pre/post-deployment repeatability for natural environment observation periods of up to one week were observed to be $r > .99$, $ICC_{1,1} > .97$; $r > .99$, $ICC_{1,1} > .98$; $r > .93$, $ICC_{1,1} > .46$; $r > .99$, $ICC_{1,1} > .99$, for cigarette, cig-a-like, vape-pen, and hookah configurations respectively. **Conclusions:** It is important that researchers are aware of and report the measurement accuracy, range and repeatability of topography devices used when reporting user puffing behavior. Pre to post deployment repeatability assessment is a valuable tool for assessing integrity and self-consistency of topography data. The wPUM™ second generation family of monitors are shown to be accurate across the range of observed real use topography.

FUNDING: Academic Institution

PS1-116

PERCEPTIONS OF SMOKER STIGMATIZATION AMONG NEW ZEALAND MAORI AND QUITTING BEHAVIOUR FINDINGS FROM THE INDIGENOUS ITC NZ STUDY

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Background and objectives: Campaigns aiming to create smoke-free normative beliefs (SFNBs) can help to deter smoking uptake or promote smoking cessation. Such beliefs may also be reinforced as smoking prevalence continues to decline in many countries. However, if SFNBs lead to smokers feeling stigmatized this could be a barrier for quitting. This is a particular concern for indigenous peoples who often experience high rates of smoking. This study explored whether perceived stigmatization of smokers was associated with quitting behaviour among New Zealand Māori smokers. **Methods:** Results were from Wave 1 (2018-2019) of the New Zealand Te Ara Auahi Kore (TAKe) cohort study, an indigenous partner to the International Tobacco Policy Evaluation (ITC) Project. Data reported here covered 305 Māori daily smokers. The TAKE Study employs a detailed questionnaire based on the ITC and the Australian Talking About the Smokes Study. Respondents were categorized as perceiving stigmatization of smokers if they agreed that smokefree policies made smokers second class citizens or that some people looked down on them because they smoked or that they felt ashamed when they were seen smoking. We calculated adjusted odds ratios for a recent quit attempt (in last 12 months) between those perceiving stigmatization and those who did not (adjusted for age, sex, education, and household income). **Results:** Almost three quarters of respondents perceived smokers to be stigmatized and almost half had made a quit attempt in the last 12 months. Māori smokers who perceived smoker stigmatization were more likely to make a quit attempt compared to those not perceiving stigmatization (unadjusted OR = 1.5; adjusted OR = 1.7). **Conclusion:** Our results suggest that stigma associated with smoking may increase quitting behaviour among the New Zealand Māori. However, experiencing smoking stigma may also negatively impact on wellbeing among Māori, particularly for those who are unable to quit. A possible solution is to design campaigns that promote SFNBs but ensure these are empathetic towards smokers and are balanced by interventions that aim to create supportive environments to aid quitting.

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PS1-118

E-LIQUID PURCHASE AS A FUNCTION OF WORKPLACE RESTRICTION IN THE EXPERIMENTAL TOBACCO MARKETPLACE

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Significance: Whether E-cigarettes can be used in smoke-free environments is currently being debated. Evaluating such a policy would indicate whether permitting E-cigarette use in smoke-free environments, such as the workplace, alters the use of conventional cigarettes and other tobacco products. This evaluation can be carried out



at the Experimental Tobacco Marketplace (ETM). The ETM places a mix of products and prices that allows the estimation of the effect of new policies and/or products on smokers' purchasing behavior under conditions that simulate "real-world" circumstances. To evaluate workplace policy, participants had the option to vape while working or not, when engaged in simulated work. **Method:** A two by two design was used to assess workplace policy (E-cigarettes permitted vs. not permitted) and nicotine concentration (24mg/mL vs. 0mg/mL). Participants (n=26) completed one sampling and two ETM/workplace sessions per week during two weeks. During the sampling session, participants were given an e-cigarette with a 2-day supply of a commercially available refill of e-liquid of their preferred flavor. Before the ETM session, participants were informed whether E-cigarette use was allowed that day. During the four ETM sessions, participants purchased for the following 24 hrs, including the 4-hr workshift that started immediately after they finished buying products in the ETM. The workplace session consisted of data entry tasks in a mock office environment. Participants could use any tobacco products during two 15-min breaks. The order of the conditions was counterbalanced. **Results:** The results show that permitting E-cigarettes use in the workplace increased e-liquid purchase on average, but nicotine concentration had no effect on e-liquid demand. Cigarette demand was unaltered across conditions. **Conclusions:** The present study suggests that allowing e-cigarette use in the workplace would increase demand for e-liquid regardless of nicotine strength. However, it would not change conventional cigarette demand.

FUNDING: Federal

PS1-119

ASSOCIATIONS BETWEEN E-CIGARETTE USE AND QUITTING BEHAVIORS AMONG SOUTH AFRICAN ADULT SMOKERS

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SIGNIFICANCE: The South African Medicines Control Council classifies e-cigarettes as Schedule 3 substances and requires them to be dispensed only within pharmacies. E-cigarettes are however ubiquitous in South Africa and are easily accessible online and in retail outlets where they are marketed as cessation aids. We investigated the relationship between e-cigarette use and sustained quitting lasting six months or longer among South African smokers. **METHODS:** Data came from a 2018 web survey of South African adults aged 18+ years (n=18,208). Cessation-related attitudes and behaviors were assessed. Using multivariable logistic regression, we measured the association between e-cigarette use and sustained quitting. Data were weighted and analyzed using R version 3.5.1. **RESULTS:** Of all regular smokers, 74.5% had attempted to quit and 42.8% of these had ever used any cessation aid. Among past-quit-attempters, ever e-cigarette users were more likely than never e-cigarette users to have ever used any cessation aid (50.6% vs. 35.9), yet 97.5% of regular e-cigarette users were regular smokers. Among current regular smokers, more e-cigarette ever vs. never users believed e-cigarettes could assist smokers completely quit (35.5% vs. 20.4%) or cut down (51.7% vs. 26.5%). The proportion reporting sustained quitting among ever-established smokers who had tried to quit was lower for e-cigarette-only users (17.9%) than those using only: nicotine replacement therapy (34.6%; prevalence ratio [PR]=1.93; 95%CI=1.35-2.64), prescription cessation medication (35.1%; PR=2.07; 95%CI=1.36-2.87), cessation counseling (46.8%; PR=2.63; 95%CI=1.62-3.48), or cold turkey (i.e., no intervention at all; 46.7%; PR=2.68; 95%CI=2.11-3.33). Within adjusted analyses, the odds of sustained quitting were lower among those who only used e-cigarettes once off/rarely (AOR=0.16; 95%CI=0.13-0.19); former users (AOR=0.23; 95%CI=0.18-0.28), and current users (AOR=0.22; 95%CI=0.17-0.28), than never users. **CONCLUSION:** E-cigarette use depressed long-term cessation. E-cigarettes may perpetuate smoking rather than encouraging complete switching. These findings can inform restrictions on unsubstantiated claims of e-cigarettes as cessation aids within South Africa. Comprehensive tobacco control and prevention strategies can help calibrate social norms and reduce aggregate tobacco consumption.

FUNDING: Other

PS1-120

PERCEPTIONS ABOUT E-CIGARETTES AND PREVALENCE OF E-CIGARETTE USE AMONG FLORIDIAN MIDDLE AND HIGH SCHOOL STUDENTS

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Significance: Use of electronic cigarettes (e-cigarettes) has become increasingly popular among youth in the past few years. Minimum legal sale age (MLSA) policies were established across the United States. On July 1st, 2014, a similar MLSA policy went into effect in Florida limiting e-cigarette access to adult residents (age 18 and older). **Methods:** Youth's responses from the May 2014 and May 2015 Florida Youth Tobacco Survey (FYTS) were used to analyze pre- and post-policy implementation trends. Difference-in-difference (DID) models were used to examine the impact of the MLSA policy on Florida students ever and current e-cigarette use. Youth's perceptions about e-cigarettes were compared between the two years using the chi-square test. **Results:** Percentage of youth who tried e-cigarettes at least once in their lifetime (ever use) increased significantly (p < .0001) from 14.4% in 2014 to 25.6% in 2015. Current e-cigarette use among youth also significantly (p < .0001) increased from 7.3% in 2014 to 12.3% in 2015. After adjustment for other covariates, no significance was found for the interaction term (DID) between the policy year (2014 vs 2015) and the age group (adults vs minors). Within the sample of youth who were not current e-cigarette users, compared to 2014, significantly (p < .0001) more minors in 2015 considered e-cigarettes less harmful than cigarettes (27.5% vs 25.3%), less addictive than cocaine/heroin (22.3% vs 12.2%), harder to quit (36.6% vs 29.4%), disruptive of friendships (36.5% vs 28.7%), socially unappealing (73.4% vs 69.4%), disruptive of comfort in social situations (39.2% vs 34.2%), and useless in relieving stress (34.2% vs 27.3%). Compared to 2014, an equivalent significant (p < .0001) change occurred within the sample of minors who were current e-cigarette users in 2015. **Conclusions:** MLSA policy may not be enough as a stand-alone intervention. Intrapersonal (e.g., peer-to-peer, parent, health provider), organizational (e.g., school curriculum, anti-tobacco student groups), and community (e.g., health fairs) interventions may be needed to ensure tobacco prevention and reduction among youth.

FUNDING: Unfunded

PS1-121

SMOKE FROM HIGH BUT NOT LOW NICOTINE CONTENT CIGARETTES INDUCES DEPENDENCE IN RATS

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Significance: The addictive properties of nicotine drive cigarette smoking. The US FDA has the authority to lower the nicotine levels in cigarettes to make them minimally or non-addictive. Recent clinical studies suggest that smokers who switched to low nicotine content cigarettes were able to quit smoking. Other tobacco smoke constituents such as acetaldehyde are known to potentiate the reinforcing effects of nicotine in animal models. Therefore, it is essential to determine the addictive potential of reduced nicotine content cigarettes. **Methods:** Adult male Wistar rats were exposed to smoke from Spectrum low nicotine (0.07 mg/cigarette) or high nicotine (0.84 mg/cigarette, conventional cigarette) cigarettes for 35 consecutive days. Control rats were not exposed to tobacco smoke. During the smoke exposure period, mecaminylamine (2 mg/kg, sc) precipitated somatic withdrawal signs and spontaneous locomotor activity was studied. After cessation of smoke exposure, rats were assessed for reward deficits, anxiety, and depression-like behaviors. Finally, we evaluated the effect of nicotine-induced locomotor sensitization (base, 0.4 mg/kg, sc) in the smoke-exposed rats. **Results:** The rats exposed to low and high nicotine smoke gained less weight during smoke exposure and the withdrawal period. This reduced weight gain was more evident in the high nicotine than low nicotine smoke group. A time-dependent (day 15, 22, and 29) increase in severity of somatic withdrawal signs was observed in the high, but not low, nicotine smoke-exposed rats. Low and high nicotine smoke exposure did not change the locomotor activity in rats. Cessation of chronic low or high nicotine smoke exposure did not produce negative affective symptoms of nicotine withdrawal. Repeated nicotine injections produced a greater increase in locomotor activity in the high nicotine smoke group than in the low nicotine smoke and control groups. **Conclusions:** These results suggest that people who smoke low nicotine are less likely to become addicted to cigarettes than people who smoke regular cigarettes. Banning the sale of conventional cigarettes to people might lead to a decrease in the number of addicted smokers.

FUNDING: Federal

PS1-122

TOBACCO SMOKING BAN IN U.S. PUBLIC HOUSING - RESIDENT PERSPECTIVES ON IMPLEMENTATION AND IMPACT

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SIGNIFICANCE: There are significant tobacco use disparities by income level. Individuals living at or below the poverty line are more likely to report current use compared to higher income individuals. In 2018, the Department of Housing and Urban Development (HUD) implemented a tobacco smoking ban inside and within 25 feet of all public housing properties. We sought to gain insight regarding the policy, the local implementation approach, perceived fairness, positive and/or negative impact, compliance barriers, and cessation resources from the perspective of public housing residents. **METHODS:** Participants were recruited through subsidized housing communities with the help of community partners. This qualitative study conducted semi-structured focus groups both pre-implementation (tobacco smokers and non-smokers, N = 15), and post implementation (tobacco smokers and recent quitters, N = 14) among public housing residents. Focus groups were audio-recorded, transcribed verbatim, and analyzed using grounded theory. **RESULTS:** Participants were 60% female, middle-aged, and self-identified African Americans (100%). Pre-implementation themes included a cursory awareness of the policy among residents, lack of awareness regarding the compliance strategy, psychological reactance regarding cessation, and distinct differences in policy support between smokers and non-smokers. Post implementation themes included: general awareness of the policy - though an insubstantial and skeptical understanding of its purpose was apparent, dissatisfaction with the implementation approach by the local public housing authority, varied perceptions regarding fairness of the policy, efforts to circumvent the policy among smokers with low motivation to quit, concerns about the consequences of non-compliance, increased motivation to reduce smoking and/or quit, and the need for on-site, culturally appropriate tobacco cessation resources. **CONCLUSIONS:** The perspectives and lived experiences of public housing residents have important implications for adoption and maintenance of the HUD tobacco ban. With appropriate cessation support, the policy has the potential to reduce tobacco use disparities.

FUNDING: Academic Institution

PS1-123

HOW DOES PERCEIVED UNFAIRNESS AFFECT COMPLIANCE WITH SMOKE-FREE HOUSING?

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SIGNIFICANCE: There is evidence of low compliance with smoke-free housing (SFH) policies adopted by local housing authorities (HAs) in response to the HUD rule. Our past work has shown that residents' perceived fairness of SFH can affect compliance with SFH. Procedural Justice Theory suggests that perceived unfairness can have wider impacts, such as decreasing trust in important institutions and increasing marginalization of vulnerable groups. This study assessed how perceived legitimacy—a construct that operationalizes perceived fairness—affects low-income housing residents' willingness to comply with HA rules. **METHODS:** We developed scales assessing perceived legitimacy of (a) SFH and (b) the HA; and willingness to comply with (c) SFH and (d) other HA rules. These were administered to 900 low-income housing residents in Norfolk, VA in the summer of 2019. Regression modeling was used to assess the relationships between these variables, current smoking status and whether a resident lived in a building with a SFH policy. Interactions were used to model potential moderating relationships. **RESULTS:** Smokers living in SFH buildings exhibited 26% and 20% lower perceived legitimacy of SFH and the HA, respectively, compared to smokers living in buildings without a ban. Current smoking, perceived legitimacy, and willingness to comply with both SFH and other HA rules showed a similar pattern of differential associations based on SFH exposure. Notably, current smoking was associated with a 9% decrease in willingness to comply with other HA rules, but this was limited to those exposed to SFH. **CONCLUSIONS:** Our results confirm that smoker's perceived legitimacy of SFH is associated with their willingness to comply with these policies. Further, SFH adoption was also associated with lower perceived legitimacy of the HA and willingness to comply not only with SFH, but also other HA rules. Perceptions of unfairness of SFH policies could undermine low-income housing residents' relationships with housing providers. These findings speak to the need for further research on best practice implementation strategies to optimize the benefits of smoke-free housing policies.

FUNDING: Federal

PS1-124

EXPOSURE TO E-CIGARETTE ADVERTISING AND E-CIGARETTE USE AMONG YOUNG ADULTS IN HONG KONG -- THE MEDIATING ROLE OF E-CIGARETTE PERCEPTIONS

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Objective: Exposure to e-cigarette advertising is associated with e-cigarette use. We examined the role of e-cigarette perceptions for mediating the relationship between e-cigarette advertising exposure and e-cigarette use among young adults in Hong Kong. **Methods:** An online survey was administered to a convenience sample of Hong Kong residents aged 18-35 (N=1,186). Exposure to e-cigarette advertising was measured by self-reported frequency ("never", "1 time", "2 times", "3 times", "4 or more times", and "don't know") of seeing e-cigarette advertising in past 6 months from 5 sources (i.e., retail stores, Internet/social media, TV, newspapers/magazines, and bars/restaurants/karaoke). Responses were dichotomized for each source (Yes/No). An overall exposure index was created as the sum of responses from all sources (range 0-20). Measures of e-cigarette perceptions included perceived harm/addictiveness/popularity of e-cigarettes, and perceived harm of secondhand e-cigarette aerosol. Participants rated on a 0-10 scale for each item with greater values indicating perceived more harm/addictiveness/popularity. E-cigarette use outcomes included ever and current use and susceptibility. Mediation analyses were performed using the joint test of significance to examine if e-cigarette perceptions mediated the relationship of e-cigarette advertising exposure at each source and the overall index with e-cigarette use controlling for demographics and current smoking status. **Results:** Our sample (24.2 years old, SD=5.14; 54.7% women) included 16.1% ever and 4.8% current e-cigarette users. Exposure to e-cigarette advertising was highest for Internet/social media (43.6%), followed by bars/restaurants/karaoke (20.0%), retail stores (16.8%), newspapers/magazines (16.3%), and TV (13.6%). Advertising exposure at each source and the overall index were associated with higher perceived popularity of e-cigarette use, which in turn, was associated with more ever and current use of e-cigarettes. Other perceptions were not significant mediators. **Conclusions:** Findings indicate that e-cigarette advertising restrictions may help reduce the perceived popularity and in turn reduce e-cigarette use.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS1-125

ORGANIZATIONAL CHARACTERISTICS ASSOCIATED WITH ADOPTION OF COMPREHENSIVE TOBACCO PREVENTION AND CESSATION SERVICES FOR MEDICAID ENROLLEES IN CALIFORNIA

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Significance: In November of 2016, the California Department of Health Care Services (DHCS) issued an All Plan Letter (APL 16-014) to the California Medicaid Managed Care Programs (MCPs) to provide information and guidance on MCP requirements for comprehensive tobacco cessation services. We set out to examine Medicaid's MCPs' progress in implementing each section of APL 16-014 and identify factors associated with higher levels of implementation. **Methods:** From September 2018 through February 2019, UCSD researchers surveyed health educators and relevant personnel within California's 25 Medicaid MCPs to document each MCP's smoking cessation services and policies in 2018. Data were collected via three methods: (1) a web-based survey, (2) an in-depth phone interview, and (3) researcher collection of MCP smoking cessation relevant-documents. Data were collected for 24 of the 25 Medicaid MCPs (i.e., 96% response rate). **Results:** On average, MCPs fully implemented three of eight sections of the APL. Organizational factors associated with higher levels of implementation included organizational size (i.e. total enrollment) where the largest MCPs (i.e. 1,000,000+ members) had implemented an average of 4.38 sections of the APL, the medium sized MCPs (250,000-999,999 members) had implemented an average of 2.89 sections, and the smallest MCPs (<250,000) had implemented only 1.71 sections; organizational composition where Medicaid only MCPs had lower implementation on average (2.44) compared to MCPs with commercial and Medicaid enrollment (4.67); and organizational capability to measure overall smoking rates (4.7) compared to MCPs that are not able to measure smoking rates among their members (1.67). **Conclusion:** These results indicate that although APL 16-014 was successful in creating more consistent benefits across MCPs, 95% of MCPs have not fully implemented all



eight sections of the APL. DHCS may want to consider issuing guidance for full adoption of APL 16-014 that takes into account differences in organizational characteristics and capabilities.

FUNDING: State; Academic Institution; Nonprofit grant funding entity; Other

PS1-126

ALKALOIDS AND NITROSAMINES IN TOBACCO FILLER ON HALF SMOKED CIGARETTES: IMPLICATIONS FOR CIGARETTE RELIGHTING

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BACKGROUND: Extinguishing and relighting cigarettes is a relatively unexplored smoking behavior. Certain sub-populations such as women, African-Americans, unemployed, and menthol smokers are more likely to engage in this behavior. Moreover, relighting cigarettes is associated with increased lung cancer risk and higher rates of chronic bronchitis. We aimed to measure tobacco alkaloids and tobacco-specific nitrosamines (TSNA) in the tobacco filler of half-smoked cigarettes to assess whether smoking a re-lit cigarette may lead to higher exposures to these constituents than the first half of the same cigarette. **METHODS:** Levels of nicotine, minor alkaloids and TSNA were measured in Marlboro Gold and Menthol cigarettes (both in king-size and 100s version) by our validated methods. We used two smoking regimens (ISO and Canadian Intense, CI), and the levels of constituents were measured in the original tobacco filler, and in tobacco filler of half-smoked cigarette. Each cigarette was smoked and analyzed in duplicate. **RESULTS:** Compared to the levels measured in the tobacco filler of unburned cigarette, nicotine in the filler of half-smoked cigarettes generally increased by approximately 8% under both ISO and CI regimens. Levels of norcotinine, anatabine, and anabasine generally decreased, particularly after CI smoking. Levels of NNK, a carcinogenic TSNA, consistently increased in all brands tested, the increase ranging from 23% to 199% under CI conditions. Changes in levels of NNN, another carcinogenic TSNA, were not consistent. Generally, results differed by smoking intensity and by individual brand; however there was no apparent effect of cigarette length or menthol. Correction for moisture content of the filler in a subset of samples showed further increase in constituent levels. **CONCLUSION:** Higher levels of some important harmful constituents in tobacco filler of half-smoked cigarette may lead to higher levels of these constituents in smoke when the cigarette is relit. Further research is warranted to better understand the effect of cigarette relighting on harmful exposures and relevant health outcomes in smokers who are engaging in this practice.

FUNDING: Academic Institution

PS1-127

E-CIGARETTE USE AMONG 11TH GRADE HIGH SCHOOL STUDENTS BEFORE AND AFTER THE TOBACCO 21 POLICY IN CALIFORNIA, CALIFORNIA HEALTHY KIDS SURVEY 2014-2018

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Significance: The prevalence of e-cigarettes in US high school students was 16.3% in 2015, 11.3% in 2016, 11.7% in 2017, and increased to 20.8% in 2018. Prior to this increase, California increased the age to purchase tobacco (including e-cigarettes) from 18 to 21 through a policy called 'Tobacco 21' (T21), implemented June 2016. This analysis examined changes in e-cigarette use in California before and after the T21 policy, overall and by socio-demographic groups. **Methods:** Data from the 2014-2018 California Healthy Kids Survey was limited to 11th grade high school students not missing information on e-cigarettes (n=535,459). Current e-cigarette use in the 2 school years before T21 was compared with the 2 school years after; overall and by gender, race/ethnicity (Hispanic, non-Hispanic (NH) American Indian/Alaskan Native, NH Black, NH Native Hawaiian/Pacific Islander, NH White, and NH mixed), average grades in the past year, and parents' highest level of education. Adjusted logistic regression models were used to examine changes in e-cigarette use from 2016/2017 to 2017/2018 when there was a large increase in US prevalence. **Results:** The prevalence of e-cigarette use among 11th grade students was 14.8% in 2014/2015, 11.8% in 2015/2016, 9.2% in 2016/2017, and increased 45% to 13.3% in 2017/2018. In 2017/2018, race/ethnic groups with the highest prevalence of e-cigarette use included NH White (19.7%), NH American Indian/

Alaskan Native (18.0%), and NH Native Hawaiian/Pacific Islander (16.3%). Students with mostly A's in the past year were less likely to use e-cigarettes (10.0%) compared with students with mostly F's (31.6%). Adjusted for covariates, the odds of e-cigarette use in 2017/2018 was 59% (95% CI: 55%, 63%) higher than 2016/2017. An increase was observed across socio-demographic groups. **Conclusion:** Among California 11th grade students, e-cigarette use increased an adjusted 59% from the first to second school year after California T21, which is in parallel with national trends. While T21 policies are just one step, a comprehensive tobacco control approach is needed, such as eliminating flavors and removing the moratorium on FDA regulation of e-cigarettes.

FUNDING: Federal

PS1-128

E-CIGARETTE USE AMONG CHINESE URBAN POPULATION IN 2018-2019

Shu-Hong Zhu, **Shiushing Wong**, **Yue-Lin Zhuang**, **Jijiang Wang**. University of California San Diego, La Jolla, CA, USA.

Significance: E-cigarettes were first commercialized and introduced into Chinese market in 2003. However, e-cigarettes did not become popular in China until recently (after being more widely used in countries like U.S. and U.K.). This study examines the use of e-cigarettes among the Chinese urban population in 2018-2019 and its relation to cigarette smoking behavior. **Methods:** Adult members of a commercial online panel from 19 major cities in China participated between October 2018 to April 2019 (N=20,055). Measures of e-cigarette use include "Have you ever used e-cigarettes?" and "Have you used e-cigarettes in the past 30 days?" **Results:** Overall, 17.5% had ever used e-cigarettes, and 6.8% had used in past 30 days. The use of e-cigarettes is almost exclusively limited to ever-cigarette-smokers: the rate of ever use of e-cigarettes for never-cigarette-smokers is only 1.9%. In contrast, the rate of ever use of e-cigarettes for ever smokers who have not yet smoked 100 cigarettes is 21.0%, and the rate of ever use of e-cigarettes for those who have smoked 100 cigarettes is 42.2%. The probability of e-cigarette use is significantly greater among ever smokers with higher education levels. The rate of past 30-day use of e-cigarettes among ever smokers with a bachelor degree is 18.5%, compared to 9.7% among ever smokers who have not obtained a bachelor degree. E-cigarettes are perceived as significantly less harmful than cigarettes, with mean rating 5.6 vs. 8.8 (P<.001), respectively, in a 1-10 scale. Use of e-cigarettes is associated with greater likelihood of attempt to quit smoking in the past 12 months, 55.5% vs. 39.6% for e-cigarettes users and non-users respectively (P<0.001). **Conclusions:** E-cigarettes have gained a strong foothold among the Chinese urban population. Among adults, the main group interested in e-cigarettes are those who have experimented with cigarettes in the past or who are current smokers. E-cigarettes are particularly attractive to smokers who are college graduates, and those who want to quit cigarette smoking. These data suggest the adoption of e-cigarettes may contribute to the reduction of cigarette smoking in China in years to come. **Implications:** The results suggest a careful regulation of e-cigarette in China may contribute to the reduction of cigarette consumption.

FUNDING: Federal; Academic Institution

PS1-129

HEAT-NOT-BURN TOBACCO USE AMONG URBAN POPULATION IN CHINA IN 2018-2019

Shiushing Wong, **Yue-Lin Zhuang**, **Shu-Hong Zhu**. University of California San Diego, La Jolla, CA, USA.

Significance: Heat-Not-Burn (HNB) tobacco products, such as IQoS by Philip Morris International, was introduced into Asia (first in Japan) in 2014. The sale of IQoS in China was briefly banned before it was allowed. Currently, Chinese tobacco industry is actively working on multiple domestic versions of HNB products. This study measures the use of HNB in Chinese urban population. The relationship between the use of HNB and regular cigarettes is also examined. **Methods:** Adult members of a commercial online panel from 19 major cities in China participated between October 2018 and April 2019 (N=20,055). Two examples of HNB products, IQoS and IUOC (a domestic brand) were shown on the screen and respondents were asked if they had ever used HNB and whether they used in the past 30 days. **Results:** Overall, 4.1% had ever used HNB, and 2.0% had used in past 30 days. The use of HNB is almost exclusively limited to ever-cigarette-smokers: the rate of ever use of HNB for never-cigarette-smokers is only 1.0%. The rate of ever HNB use among ever smokers who have not yet smoked 100 cigarettes is 4.4%, and the rate of ever HNB use among those who have smoked 100 cigarettes is 9.2%. The probability of HNB use is significantly greater among ever smokers with a higher education level. The rate of past 30-day use of HNB among



ever smokers with a bachelor degree is 5.0%, compared to 2.6% among ever smokers who have not obtained a bachelor degree. Smokers who currently used HNB products were more likely to have made an attempt to quit regular cigarettes in the past 12 month than non-HNB users (63.9% vs. 42.7%, $p < 0.001$). **Conclusions:** HNB, though a relatively new product, had already attracted a non-negligible proportion of Chinese users among its urban population. Similar to e-cigarettes, HNB users are mostly ever cigarette smokers and are more likely to be smokers with higher education. The use of HNB and its potential effects on the population use pattern of various tobacco products among Chinese population needs to be closely monitored.

FUNDING: Federal; Academic Institution

PS1-130

COMPARING THE PERCEPTIONS OF KEY OPINIONS LEADERS OF THE TOBACCO RETAIL ENVIRONMENT AND RETAILER PRACTICES

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Background: The retail environment has been identified as an area that largely contributes to tobacco disparities. Independent retailers in racial/ethnic communities have been understudied in how they comply with and understand tobacco regulations. **Methods:** Focus groups were conducted with 57 Key Opinion Leaders (KOL's) from African-American (AA), Hispanic/Latino (HL), and Non-Hispanic White (NHW) communities. The KOL's represented various occupational backgrounds. They completed an anchoring survey and 90-minute focus group on their awareness and attitudes of the FDA and tobacco regulatory policy. Thematic analyses on the focus group data identified differences between communities. The study also recruited 576 independent tobacco retailers from the same communities. The retailers were interviewed to assess their knowledge of the FDA and tobacco policies, attitudes towards the FDA, and perceived benefits of selling tobacco. A store observation assessed product availability, placement, presence of promotions, exterior ads, and regulatory materials. Logistic regression analyses were conducted to examine what variables contributed to retailer behaviors. **Results:** For all communities over half of the KOL's were aware of the FDA's role in regulating tobacco products. Less than half believed that retailers in their community would be aware of this role. Focus group revealed AA KOL's expressing a higher level of distrust compared to the other communities. All communities expressed the desire to collaborate with the FDA in their regulatory efforts. Less than half of the AA and HL retailers were aware of the FDA's role in tobacco regulation. Retailers in the AA communities had higher odds of being non-compliant. **Conclusions:** The data presented in these studies identified disparities in independent tobacco retailer compliance and other practices that further exacerbate disparities. Regulatory and public health agencies should include both KOL's and retailers in their efforts. Outreach with racial/ethnic communities is essential to increase retailer and community buy-in as we work to address tobacco use disparities

FUNDING: Federal

PS1-131

EXPOSURE AND PERCEPTIONS OF SECONDHAND SMOKE EXPOSURE IN MULTIUNIT HOUSING IN LOS ANGELES FROM ELECTRONIC SMOKING DEVICES, CANNABIS, AND CONVENTIONAL TOBACCO.

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BACKGROUND: Although California and other local jurisdictions have established smoke-free policies in varied locations to protect public health (such as in the workplace, bars, and restaurants), many cities like Los Angeles have yet to implement policies that will protect tenants living in multiunit housing (MUH). With the current uptake of the use of e-cigarettes as well as recreational cannabis, it is important to understand how tenants are being affected by exposure to secondhand smoke (SHS) from tobacco, cannabis, and e-cigarettes, as well as their perceptions of smoke-/vape-free policies. **METHODS:** Door-to-door surveys were conducted with tenants in predominantly low SES Hispanic/Latino, African American, and Non-Hispanic White communities living in randomly selected MUH buildings with 20 or more units in Los Angeles to assess knowledge, attitudes, beliefs and behaviors, regarding SHS and smoke-free policies in MUH that include restricting the use of tobacco, cannabis, and e-cigarettes. Frequencies and Chi-Square tests are used in this analysis. **RESULTS:** Of the 202 surveys collected, 66% of respondents were exposed to SHS from tobacco, e-cigarettes, and/or cannabis in MUH. Two-thirds (68%) preferred to live in a completely non-smoking property (including outdoor common areas), and 74% preferred to live in a non-smoking section of

a building. Seventy-nine percent (79%) stated they support smoke-/vape-free policies that implement either a complete 100% ban (including common areas, balconies, and patios) or partial bans (where there are designated or set aside smoking sections) on tobacco, electronic vape and cannabis respectively. **CONCLUSIONS:** Most tenants surveyed are experiencing exposure to SHS from both tobacco and cannabis. The majority surveyed support smoke-free policies that either partially or completely ban the use of tobacco, e-cigarettes, and cannabis in MUH to avoid SHS exposure. We are further examining the data to explore preferences of a partial from full ban. The findings from this study can inform local municipalities that are considering how to protect tenants from exposure from tobacco and cannabis smoke.

FUNDING: State; Academic Institution

PS1-132

EFFECT OF CIGARETTE SMOKING AND HONEY ON LIPOPOLYSACCHARIDE (LPS)-INDUCED LUNG INFLAMMATION.

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Introduction: Cigarette smoke (CS) is a significant risk factor in the pathogenesis of pulmonary diseases. Alveolar macrophages (AM) are known to play an essential role in lung defense. Honey is used as a traditional medicine for colds, skin inflammation but not edible. However, there are few reports of anti-inflammation activity on pulmonary inflammation by honey. It is also known that Lipopolysaccharides (LPS) induces lung inflammation. We previously reported that CS inhibited the immune functions of AM. However, it is unclear that CS and honey effect on LPS induced lung inflammation. In this study, we investigated whether CS and honey affect the functions of AM and LPS-induced lung inflammation. **Materials and Methods:** Mice were exposed to CS for 10 days. Following exposure to CS, mice inhaled 60µg of LPS by intranasal administration (CS-LPS). One day following inhalation of 600µg of Japanese honey, mice inhaled LPS. Mice not exposed to CS also inhaled LPS (NS-LPS). Alveolar macrophage (AM) and neutrophil (Neu) were obtained by broncho-alveolar lavage (BAL). Expression of TLR4, CD14 surface antigen and production of reactive oxygen species (ROS) of AM and Neu were analyzed by FACS. Chemotactic activity for Neu was measured by EZ-TAXIScan. Cytokines and NF-κB mRNA expression were assayed by RT-PCR. **Results:** Neu counts were significantly increased with LPS inhalation. Expression of TLR4 in neutrophils and AM was significantly decreased in CS-LPS. Hydrogen peroxide production from Neu was significantly increased in CS-LPS. IL-1β, TNF-α, CXCL1 and NF-κB mRNA expression of Neu were not different between NS-LPS and CS-LPS. Hydrogen peroxide production from Neu was increased by CS. Honey inhibited chemotactic activity and hydrogen peroxide production of Neu. Honey inhibited IL-1β and CXCL1 mRNA expression of AM by LPS stimulation. Honey also inhibited infiltration of neutrophils to the lung by LPS. **Conclusions:** These results suggest bacterial recognition by neutrophils is inhibited by CS. This inhibition may result in increased bacterial or viral pulmonary infection. Honey induced anti-inflammatory activity via the suppression of infiltration of neutrophils to the lung through the inhibition of IL-1β and CXCL1 mRNA expression.

FUNDING: Academic Institution

PS1-183

OXIDATIVE STRESS BIOMARKERS CHANGES INDUCED BY EXPOSURE TO E-CIGARETTE VAPE IN RATS

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Significance: E-cigarettes vaping has been spreading globally, and was lately associated with multiple toxicities to human organs. In the present study, the status of oxidative stress biomarkers has been investigated in lung tissues of rats chronically exposed to e-cigarettes vape. **Methods:** Lung tissues were sampled from rats exposed to e-cigarettes vape as standard solution of (70/30) PG/VG ratio with 18 mg/ml; nicotine concentration for 1 hr/day, every day, for four weeks and compared to room air exposed controls. E-cigarettes vape Oxidative stress biomarkers including oxidized and reduced glutathione (GSH, and GSSG), glutathione peroxidase (GPx), catalase, superoxide dismutase (SOD), Thiobarbituric acid reactive substances (TBARs) were assessed. **Results:** Results showed that exposure of animals to e-cigarettes vape resulted in a significant reduction in the levels of GSH, and the ratio of GSH to GSSG, and an increase in the levels of GSSG in lung tissues. Additionally, the activities of oxidative capacity enzymes including GPx, and catalase, whereas the levels TBARs, the biomarker for lipid peroxidation, were reduced in animals exposed to e-cigarettes vape. **Conclusion:** Current results indicate



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that e-cigarettes vaping could be associated with increased oxidative stress and lipid peroxidation along with reduction in oxidative capacity enzymes that might predispose users to several health risks.

FUNDING: Academic Institution



POSTER SESSION 2

PS2-4

THE EVOLUTION OF THE NATIONAL HEALTH INTERVIEW SURVEY (NHIS)

Maria A. Villarroel, PhD. National Center for Health Statistics, CDC.

Significance: The National Health Interview Survey (NHIS) has monitored the health of the civilian noninstitutionalized population of the United States since 1957, and has covered adult tobacco use since 1965. NHIS has the ability to monitor tobacco use across many demographic and socioeconomic characteristics. NHIS is vital for informing on the prevalence and trends of tobacco use among young adults (18-24), an important age group experiencing an increase in the use of tobacco products. **Methods:** In 2019, NHIS underwent a major redesign in content and structure. This presentation will discuss tobacco use measures available annually, on a rotating basis, and periodically as part of the redesigned core and sponsored content, changes and challenges to historical trends. **Results:** Among others, the aims of the redesign are to improve the measurement of covered health topics and reduce respondent burden. Family-level socioeconomic characteristics are collected in the sample adult or sample child questionnaire. One randomly selected adult aged 18 or older in the household self-reports on tobacco product use. Measures about cigarette smoking and use of electronic cigarettes continue to be part of the core interview collected annually. Smoking history including initiation and cessation are collected every other year as part of a rotating core on health-related behaviors. Measures on other tobacco products, such as cigars, pipes filled with tobacco and smokeless tobacco products are collected annually as part of sustaining sponsored content. Upcoming periodic sponsored content includes the receipt of advice to quit smoking from health care professionals. Modifications in the location and wording of the tobacco questions may affect estimate compatibility with pre-2019 survey years. **Conclusion:** The redesigned NHIS prioritizes content while maintaining validity and reliability of estimates, strong links to public health, and the Health and Human Services' agency goals, strategic plans, or initiatives. NHIS comprehensive monitoring of tobacco use informs national goals and objectives for reducing tobacco use and increasing smoking cessation attempts of young adults.

FUNDING: Federal

PS2-5

THE ROLE OF FAMILY MEDICINE IN BEHAVIORAL HEALTH AND CESSATION

Kait Perry, MPH. American Academy of Family Physicians.

Significance: The American Academy of Family Physicians (AAFP) is committed to providing family physicians the tools and resources needed to address tobacco use and nicotine dependence. Family physicians are on the frontlines of primary care and are well-equipped to provide many mental health services; most people with behavioral health conditions are diagnosed in the primary care setting. Tobacco use among adults with behavioral health conditions is astronomically higher when compared to tobacco use among adults without behavioral health conditions. Subsequently, 70% of people who use tobacco products visit a physician each year and are more likely to quit when encouraged by their doctor. Addressing this disparity is essential to reducing the leading cause of death in the United States. **Methods and Results:** Data from several recent Continuing Medical Education (CME) Needs Assessments surveys indicate family physicians have statistically significant and meaningful gaps in the medical skills necessary to provide optimal smoking cessation and tobacco-use prevention management. AAFP developed a comprehensive strategy to address this knowledge gap, including office-based quality improvement tools, point-of-care resources, patient education, physician education and CME. During the September 2019 Family Medicine Experience (FMX) Annual Meeting, AAFP will evaluate the knowledge gained by learners in a pre- and post- survey after two CME sessions covering cessation in adults with behavioral health disorders. **Conclusion:** Family physicians are primed to address mental health and cessation, however clear knowledge gaps exist. The AAFP will continue to evaluate family physician knowledge and medical skills to promote the importance of cessation in adults with mental health conditions.

FUNDING: Pharmaceutical Industry

PS2-2

CHANGING TIMES CALL FOR CHANGING MEASURES: THE EVOLUTION OF THE NATIONAL YOUTH TOBACCO SURVEY (NYTS) IN THE CONTEXT OF EMERGING TOBACCO PRODUCTS

MeLisa R. Creamer, PhD, MPH¹, Brian King². ¹Office on Smoking and Health, Centers for Disease Control and Prevention, AL, USA, ²CDC Office on Smoking and Health.

Significance: The National Youth Tobacco Survey (NYTS) is the only US nationally-representative school-based survey of middle and high school students (grades 6-12) on tobacco products use and related behaviors. NYTS was first administered in 1999, and since 2011, has been administered annually. NYTS is fielded in the spring semester, with a sample of approximately 20,000 students and response rates around 70%. **Methods:** This presentation will discuss the evolution of the NYTS since the survey's inception, including enhancements made to survey mode, measures, and reporting. **Results:** Since 1999, NYTS has assessed cigarettes, smokeless tobacco (chewing tobacco, snuff, or dip), cigars (cigars, cigarillos, or little cigars), and bidis. However, more recently, NYTS has evolved by including new and emerging products. For example, NYTS first asked e-cigarette and hookah related questions in 2011 and heated tobacco product related questions in 2019. Brand names have been added to questions on use and updated yearly, including for e-cigarette products such as JUUL. Additionally, survey measures have undergone repeated cognitive testing to assess the question, response options, and terminology in the target population. Enhancements have also been made to survey mode. After a feasibility pilot in 2018, NYTS transitioned from paper-and-pencil administration to electronic in 2019, thus allowing for the introduction of skip patterns and product images. Finally, enhancements have been made to reporting approaches. In both 2013 and 2018, increases in e-cigarette use were highlighted using a rapid reporting mechanism in Morbidity & Mortality Weekly Report (MMWR) known as Notes from the Field. To expedite data release, findings were also released in 2019 using MMWR's Surveillance Summary mechanism. **Conclusion:** Over the past two decades, modifications have been made to NYTS to maintain the validity and reliability of data while keeping pace with the evolving tobacco product landscape. Continued efforts are underway to ensure scientifically robust and timely data collection and release to effectively inform public health policy, planning, and practice.

FUNDING: Federal

PS2-3

MONITORING YOUTH AND YOUNG ADULT TOBACCO USE: LEVERAGING ONLINE DATA COLLECTION FOR TOBACCO CONTROL

Donna Vallone, PhD, MPH. Truth Initiative.

Significance: Significant challenges for survey research have emerged with the evolving communications landscape, particularly for surveying hard-to-reach populations such as youth and young adults. Moreover, the rapidly evolving tobacco landscape has also added significant complexity to monitoring patterns and correlates of product use. Together, these changes require consideration of alternative methods of data collection. **Methods:** This presentation will discuss the data collection strategy of combining the comprehensive coverage of an address-based sampling (ABS) frame with the timeliness of online data collection to develop a nationally representative sample of young people aged 15-21 for monitoring tobacco product surveillance. The TLC's bi-annual data collection schedule allows for rapid and rigorous examination of the tobacco epidemic. **Results:** Recruitment and retention efforts resulted in a large, nationally representative sample with high retention rates. **Conclusion:** This hybrid ABS-to-online data collection methodology is particularly valuable for conducting research among younger populations as it capitalizes on their increasing access to and comfort with digital communication. This method is also highly cost-effective as compared to other in-person data collection efforts.

FUNDING: Other



PS2-6

EPIDEMIOLOGY: NATIONAL PREVALENCE OF SMOKING, QUIT ATTEMPTS AND ACCESS TO TREATMENT AMONG SMOKERS WITH MENTAL ILLNESS IN BRAZIL

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Introduction: Epidemiological studies have established that smoking is highly prevalent among people with mental illness (MI) in advanced economy countries. These data are being used to re-prioritize treatment to this highly disparate group. No definitive data are available for low-to-middle income countries. The purpose of this study was to determine the national prevalence of smoking, the quit ratio, and factors related to smoking among people with MI in Brazil. Methods: We used data obtained from the nationally representative general health survey Pesquisa Nacional de Saude of 2013, which included the Global Adult Tobacco Survey (GATS) module. The survey used a complex probabilistic sample to collect data from 60,202 Brazilians 18 years or older. Analyses were conducted in R and were weighted to account for the survey design and generate national estimates. Results: In Brazil, the 2013 smoking prevalence among people with MI was 28.4% and among people with no MI was 12.8%. Both groups had high rates of past year quit attempts (51.6% vs 55.3%) but the lifetime quit ratio among people with MI was markedly lower than those with no mental illness (37% vs 54%). Adjusted odds showed that people with mental illness were more likely to be current smokers (OR [95% CI] = 2.60 [2.40, 2.82]), less likely to be former smokers (OR [95% CI] = 0.62 [0.55, 0.70]) and just as likely to have tried to quit in the past year (OR [95% CI] = 0.90 [0.78, 1.02]). Very few (3.7%) with MI and fewer with no MI (2.6%) received cessation treatment from a health professional. Conclusion: Brazil is a world leader in tobacco control. Though low compared to other countries, smoking rates among Brazilians with MI are double rates found in the general population. Those with MI were significantly less likely to quit even though they were as likely to try. Regardless of mental status, few Brazilians appear to be using publicly available cessation services. Expanding utilization of treatment might be a good place to start for Brazil to further reduce overall smoking prevalence and, specifically, decrease the prevalence of smoking among people with MI.

FUNDING: Nonprofit grant funding entity

PS2-7

PERSPECTIVES: A CONVERGENT MIXED METHODS STUDY OF MULTIDISCIPLINARY BARRIERS TO ADDRESSING TOBACCO CESSATION DURING AN INPATIENT PSYCHIATRIC HOSPITALIZATION

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Introduction: Psychiatric inpatient units are generally tobacco-free, and hospitalization provides an opportunity for tobacco cessation treatment and targeted patient and family education in a supervised setting. In current practice, upon discharge, few patients continue a tobacco cessation attempt or are prescribed a pharmacotherapeutic cessation aid. Methods: Quantitative and qualitative data were collected from two adult inpatient psychiatric units in Boston. A retrospective medical record review was conducted of patients discharged from January 2016-March 2018. Semistructured interviews were conducted with unit staff, including resident and attending psychiatrists, social workers, psychology interns, and nursing staff regarding tobacco cessation treatment practices. Results: Thirty percent (716/1963) of inpatients were smokers; 61% male, 33% homeless, 48% with a primary psychotic or bipolar disorder. Four percent (n=30) of smokers received a prescription for nicotine replacement therapy (NRT) on discharge; no patients received varenicline or bupropion. Mandatory provider offer of referral to a quit line on discharge was declined by 97% of smokers (n=693). Providers near-unanimously rated smoking cessation as having a high health benefit, but low priority on the inpatient unit. Identified barriers included assumed low patient initiative, low perceived likelihood of intervention impact, knowledge gap for evidence-based smoking cessation treatments and associated discomfort/inexperience with medication prescribing, no follow-up to assess effectiveness of provider effort, and limited provider time. Conclusions: The tobacco-free period of inpatient hospitalization is an important potential opportunity for intervention that is generally not utilized. Provider education and trials demonstrating safety and efficacy of pharmacotherapeutic cessation aids on inpatient units could address the

barriers identified to provision of tobacco cessation treatment in this setting. Given the disproportionate tobacco-related morbidity/mortality burden for those with psychiatric illness, all potential opportunities for tobacco cessation treatment should be explored.

FUNDING: Federal

PS2-8

OUTCOMES: ARE SMOKERS HOSPITALIZED FOR MENTAL ILLNESS LESS LIKELY TO QUIT?

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Introduction: One in 5 U.S. adults (45.7 million) has a mental illness or substance use disorder (MI/SUD). Rates of smoking among people with MI/SUD are 33%-70%, 2-4 times rates found in the general population. Hospital-initiated tobacco treatment is effective, but little is known regarding treatment outcomes among smokers with MI/SUD who are inpatients. This study pooled data across multiple hospital-based trials to determine the relative success in quitting among smokers hospitalized for MI/SUD compared to other study participants. Methods: We conducted a secondary analysis using data from five Consortium of Hospitals Advancing Research on Tobacco (CHART) randomized clinical trials. Each trial assessed the effectiveness of a smoking cessation intervention initiated in the hospital and continued post-discharge compared to usual care. CHART trials used a common set of study measures and follow up protocols to facilitate pooled analyses. Using discharge diagnoses from hospital records, participants were classified as having MI/SUD as the primary discharge diagnosis or not. The main outcome was self-reported 30-day point prevalence abstinence 6 months after discharge. Results: Of 6759 participants, 798 patients had acute MI/SUD. Of the 798 with acute MI, 77.9% were male, mean age was 42.5 (SD=13.0), 64.3% had > H.S. education, 43.1% were white and 30.3% were Hispanic/Latino. Propensity score matching was used to select controls from the 5,961 remaining study participants for patients with acute MI/SUD. The matched sample included 642 pairs. Logistic regression found no differences in self-reported 30-day abstinence at 6 months (OR=1.15, p=0.21) among patients with acute MI/SUD compared to matched participants. Conclusion: Patients with acute MI/SUD have high rates of smoking and high risk of tobacco-related morbidity and mortality. When provided evidence based tobacco treatment, smokers who are hospitalized for mental illness are no less likely than other inpatients to quit smoking. Data will also be presented on quit rates among people with non-acute history of MI/SUD, and predictors of cessation among people with acute and non-acute MI/SUD.

FUNDING: Federal

PS2-9

ECONOMICS: THE ECONOMIC IMPACT OF TREATING TOBACCO DEPENDENCE AMONG SMOKERS WITH MENTAL AND SUBSTANCE USE DISORDERS

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Introduction: Medicaid is the largest single payer of mental health services. Coverage varies by state; many programs limit tobacco treatment benefits. Comprehensive benefits could expand access to evidence-based care for many smokers with MI/SUD. Policymakers are currently striving to cut the rising costs of medical care and are reluctant to pass new policies they perceive might add to costs. Determining the costs and benefits of a comprehensive tobacco treatment benefit is a critical step toward removing barriers to policy change. Methods: We estimated the direct and indirect costs and savings of expanding Medicaid coverage of tobacco treatment for people with MI/SUD in a Midwestern state. To estimate direct costs, we determined the savings resulting from smoking cessation within the MI/SUD population and offset these economic gains with the cost of providing comprehensive smoking cessation services as well as lost retail sales and tax revenue from reduced smoking. Data on costs and revenues were derived from the research literature and technical reports, and final costs used in the model were calculated based on prevalence data from publicly available resources and the state Medicaid program. We used the economic impact software IMPLAN (Impact Analysis for Planning) to estimate the resulting indirect and induced economic effects on the state economy. Results: We estimate that providing comprehensive smoking cessation services to the MI/SUD population covered by Medicaid would increase economic activity in the state of Kansas by \$29 \$64 million or an average of \$1,810 \$3,958 per smoker. This increased economic activity would generate 189,400 new jobs.



Each unique round of smoking cessation treatment had a positive economic impact. Other economic outcomes will be discussed. Conclusions: Comprehensive Medicaid coverage of smoking cessation services for people with MI/SUD makes public health and economic sense. Gains accrue for each round of treatment and are largest with unlimited treatment—supporting longitudinal treatment of tobacco dependence as a chronic, relapsing condition in this highly vulnerable population.

FUNDING: Nonprofit grant funding entity

PS2-10

IMPLEMENTATION: A STATE-WIDE INITIATIVE CHANGES POLICIES AND PRACTICES TO INCREASE ACCESS TO TOBACCO TREATMENT AMONG PEOPLE WITH MENTAL ILLNESS

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Introduction: Tobacco control has had little impact among people with mental illness/substance use disorders (MI/SUD). NAMI Kansas was funded by a state health foundation to lead a multidisciplinary workgroup of peers, providers, researchers, and advocates to pursue statewide policy and practice change. Methods: A participatory research approach was used to identify policy and practice gaps and formulate/pursue community-driven interventions. This included a) data collection, b) treatment guidelines and implementation, c) policy change, and d) outcome evaluation. Results: An initial statewide survey of state MI/SUD programs (N=71) found that most assess (83.1%) tobacco use but few provide evidence-based care such as counseling (20.0%) and medication (25.7%). Only 11.3% had written policies requiring staff to offer cessation services, and only 4.3% receive reimbursement for treatment. Treatment guidelines/implementation: the workgroup created a 1-page Tobacco Guideline for Behavioral Health, a self-assessment checklist for programs to identify guideline implementation gaps, a guideline endorsement process, and a comprehensive Implementation Toolkit. Thirty-six programs and associations have endorsed the guideline. The workgroup implemented a mini-grant mechanism to incentivize guideline implementation and partnered with a local University to provide Tobacco Treatment Specialist (TTS) training to 122 providers. Statewide policy change: The workgroup championed successful legislation to expand Kansas Medicaid benefits to provide unlimited cessation counseling and 4 annual rounds of solo or combination pharmacotherapy for all FDA approved medications, with no lifetime limits, in addition, TTSs were deemed eligible for Medicaid reimbursement. Utilization tracking: Kansas Health Insurance Information System data suggest that the percentage of people with MI/SUD in KHIIS who had at least 1 claim for tobacco counseling has made steady annual increases between 2013-2017. Conclusions: The workgroup's collaborative approach is increasing interest in addressing tobacco use as well as awareness and utilization of treatment.

FUNDING: Nonprofit grant funding entity

PS2-11

THE ASSOCIATION BETWEEN INDIVIDUAL AND SOCIAL SMOKING AND VAPING IDENTITIES AND CESSATION BELIEFS

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Background: Identity formed around a health behavior can influence behavior and susceptibility to marketing messages. Smoking and vaping identities are composed of 2 factors: a core personal identity and a social identity. The objective of this study was to examine the relationship between smoking and vaping identities and cessation beliefs. Methods: Young adult established smokers (18-34 years old) who began using e-cigarettes within the last 6 months took an online survey examining smoking/vaping identities and their smoking and vaping cessation beliefs. Participants were asked 2 questions "In 6 months (In 1 year) I see myself..." A MANOVA was used to test differences between four quitting groups (those who thought they would be smoking and vaping, smoking but not vaping, vaping but not smoking, or quit using both products) on four smoking and vaping identities (personal smoking identity, social smoking identity, personal vaping identity, social vaping identity) controlling for age, gender ethnicity, and education ($p < .05$). Results: Participants ($n = 1135$, mean age 28 years) were 58% female, 38% non-white ethnicity, and 62% less than a college degree. Personal and social identities were significantly associated with quitting beliefs. Dual users who believed they would still be both smoking and vaping 6 months and 1 year later had significantly higher personal smoking and vaping identity scores than dual users who thought they would only be using 1 product or quit using both products. Social smoking and vaping identities had more complex associations. Dual users who thought that

they would only be smoking in one year had a significantly lower social vaping identity score than those who thought they would still be smoking and vaping, only vaping, or quit both products. Dual users who believed they would only be smoking 6 months and 1 year later had significantly lower social smoker identity scores than those who thought they would still be smoking and vaping, only vaping or quit both. Conclusion: Associations between smoking and vaping identities and quitting beliefs can be used for more targeted cessation messaging and interventions for young adult dual users.

FUNDING: Federal

PS2-12

EXAMINING DAILY PATTERNS OF E-CIGARETTE AND COMBUSTIBLE CIGARETTE USE AND CHANGES OVER TIME IN DUAL USERS

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Background: At present, little is known about the dual use of combustible and e-cigarettes. This research uses ecological momentary assessment (EMA) data to examine daily and weekly use patterns at baseline and one year later. Methods: Daily smokers who also vape at least once/week (dual users) who were not interested in quitting either product were recruited to participate in a longitudinal observational study. At baseline and 1 year, participants carried a study smartphone for 2 weeks to record each cigarette and e-cigarette use event with a date and time stamp. Dual users were included in these analyses if they reported at least 1 vape event during the 2-week baseline assessment period (N=171). We analyzed daily product use patterns by time of day and day of the week for the full sample as well as product use patterns at one year post-enrollment (based on Year 1 smoking status). We also examined use patterns based on key e-cigarette dependence criteria: continued dual use at 1 year and smoking vs. vaping first in the morning. Results: At baseline, dual users' e-cigarette use peaked in the late afternoon whereas smoking rates were fairly consistent throughout the day. Vaping clearly peaked on Saturdays and combustible cigarette use was slightly higher on Friday and Saturday. Daily and weekly baseline product use patterns differed between dual users who continued to smoke and vape at Year 1 ($n=89$) and those who were only smoking at Year 1 ($n=48$) and between participants who vaped first at least 50% of the mornings at baseline ($n=41$) and those who either exclusively smoked first ($n=51$) or who vaped first on fewer than 50% of the mornings ($n=79$). Conclusions: EMA data suggest that both daily and weekly patterns of combustible and e-cigarette use differ among dual users and that e-cigarette dependence criteria are related to different use patterns. These results inform our understanding of real-world dual use and may have implications for treatment of e-cigarette and combustible dependence among dual users as well as regulatory implications.

FUNDING: Federal

PS2-13

SOCIAL MEDIA ENGAGEMENT AND POLYUSE OF TOBACCO PRODUCTS AMONG YOUNG ADULTS

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Recent studies suggest that e-cigarette use in young people is associated with rapid progression to cigarette use, and initial single and dual use often progress to poly use. Marketing, particularly the influence of internet engagement, is a major influence on use of individual tobacco products. However, little is known about the relationship of social media engagement to poly use (3 or more products), dual use, or single use. Social media appears to be a primary way to find out about new tobacco products among young adults. Current survey data are being collected from two cohorts of youth and young adults in Southern California. Preliminary analyses were conducted on individuals age 21 or older in one of the cohorts (N=1474). Data were collected one year apart in 2015 (mean age 18.9 years) and 2016 (mean age 20.2). Social media engagement with Facebook, Google plus, Instagram, Twitter, LinkedIn, and Pinterest was coded as high vs. low. The outcome was tobacco product use (cigarettes, cigars, any ENDS, hookah) one year later (0 vs. 1 product, 0 vs. 2, 0 vs. 3 or more). Polytomous regression was controlled for gender, ethnicity, parental education and wave 2 number of products used (cigarette, cigar, e-cigarette, hookah, and pipe). Analyses showed that for most types of social media engagement, odds of engagement were higher for single, dual, and poly users than non-users, although not significantly higher. Only poly use showed significantly higher social media engagement than other types of use for LinkedIn, AOR=7.19 [1.40,36.88]). Results suggest social media engagement may be



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multi-dimensional, that high social media engagement is higher for tobacco product users across dimensions and use patterns and that high engagement with Social LinkedIn may signal risk for poly use. Future analyses will try to replicate these findings on an additional cohort once data collection is complete. Other analyses treating social media as an overarching construct will be evaluated as a predictor of poly use risk. Results inform CTP priorities of marketing and communication influences in a domain that has rapidly become the most popular for youth and young adults, social media.

FUNDING: Federal

PS2-14

ROLE OF ASSETS IN CIGARETTE, CIGAR PRODUCT, AND E-CIGARETTE USE AMONG ADOLESCENTS

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Youth assets have been associated with successful transition into young adulthood, including reduction in risk behaviors such as tobacco use. Data were drawn from the Cuyahoga County Youth Risk Behavior Survey. A total of 12,936 7th-8th grade students and 13,907 high school students completed the survey (Response Rates= 83% and 60% respectively). Students were asked about past 30-day use of cigarettes, cigar products, hookah, and e-cigarettes. A validated, six-item brief assets index assessed grades in school, talking with parents about school, feeling that students decide what happens in school, feeling like you matter to others in your community, engaging in community service, and engaging in afterschool activities; two additional assets were included (trusted adult other than a parent; well-visit for physical in past year) as non-parent adult resources. Items were dichotomized and summed for a total index score. Covariates included sex, race/ethnicity, family affluence, grade in school, and household structure. Data were analyzed separately for middle school and high school surveys using SPSS Complex Samples. Overall, 12.5% of middle school students and 23.6% of high school students had used any tobacco product in the past 30 days. When examining associations with individual asset items, community service exhibited an association in the opposite direction from other assets among both middle and high school students and was removed from analysis. The 5 brief asset items plus two new items were included in the final assets measure; the resulting index was split as low (0-3) vs. high (4-7) assets. When adjusting for covariates, students with low assets were significantly more likely to currently use all tobacco products among both middle school and high school youth. Given the broad range of risky behaviors that are associated with assets, assets provide a natural focus of interventions. Methodologically, our results indicate that it is important to ascertain whether relationships between behaviors and individual assets may shift. Overall, addressing the seven identified assets may prevent or reduce use of tobacco products across school-aged adolescents.

FUNDING: Federal; State; Nonprofit grant funding entity

PS2-15

FEMALE ROLE MODELS, FAITH COMMUNITIES, AND FAMILIES AS PROTECTIVE FACTORS FOR SOMALI ADOLESCENT TOBACCO USE PREVENTION IN THE UNITED STATES

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Background: Tobacco use, especially e-cigarette and hookah use, has increased over the past decade among Somali youth in the United States (U.S.), mirroring broader adolescent trends. As U.S. tobacco landscapes evolve, identifying influential factors on Somali adolescent tobacco use and potential solutions to addressing tobacco prevention for these youth will guide tailored primary care and community prevention approaches. Objective: To identify risk and protective factors influencing Somali-American adolescent tobacco use decision-making and potential family and community roles in Somali adolescent tobacco prevention. Methods: We conducted 15 semi-structured, in-depth interviews with 12 Somali and 3 non-Somali professionals serving Minnesotan metropolitan Somali communities in clinical, educational, religious, and other community organizations. Grounded Theory informed the data collection and analysis of verbatim interview transcripts. Results: Informants cited Somali community knowledge gaps related to tobacco product-specific risks, increased tobacco exposure in Somali homes and communities, and permissive U.S. tobacco norms as contributors to rising youth tobacco use. They also highlighted Somali youth and family connections to their faith communities, the growing leadership of female role models, and parent-child relationships as influences to leverage in youth tobacco prevention. Informants shared faith-based and community approaches to strengthen Somali families' abilities to address tobacco prevention with their adolescent children as they adapt to shifts in child-rearing expectations and altered parent-child dynamics among other post-immigration challenges. Conclusions: Evolving

tobacco use exposures and norms influence Somali youth tobacco use decision-making in the U.S. Prevention efforts for Somali youth should focus on strengthening family-based strategies and engaging female and faith community leadership.

FUNDING: Federal; Academic Institution

PS2-16

PROTECTIVE FACTORS IN GENDER MINORITY YOUNG ADULT TOBACCO USE

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Background: Sexual and gender minority (SGM) communities have a well-documented disproportionate tobacco burden compared to the general population. While initiatives aimed at reducing SGM-related tobacco disparities are growing in number, few studies focus on gender minority (GM) young adults and how to best address their specific needs in tobacco control and prevention. Methods: We conducted 25 one-on-one semi-structured interviews with young adult GM ever tobacco users. Participants were 68% (n=17) assigned female at birth, and approximately 23 years old. Participants were 64.0% non-Hispanic White, 24% Hispanic (which included participants with Mexican, Puerto Rican, Bolivian, and Panamanian heritage), and 12% other or multiple race/ethnicities, which included two Hispanic/Native American participants and one Asian participant. We explored reasons GM young adults reported avoiding tobacco use to better inform initiatives aimed at preventing GM tobacco use. Results: Several reasons to avoid tobacco use related specifically to participants' physical health. Multiple participants noted their beliefs about the damaging health consequences of tobacco use and the threat of a lifelong nicotine addiction, as well as the limitations tobacco use placed on activities of daily living, such as bike riding or exercising. GM-specific concerns related to avoiding tobacco use concerned the overlap of tobacco use and the increased risks of complications in taking hormones used in gender transition measures. Conclusion: Protective factors cited as reasons to avoid tobacco use related to beliefs about mitigating tobacco's lifelong addictive potential, as well as the formidable health consequences of tobacco-related chronic disease. Participants undergoing physical gender transitions noted unique risks associated with tobacco use and hormone therapy. Health messaging that emphasizes tobacco's broad health consequences as well as GM-specific risks surrounding hormone intake and tobacco use will likely help combat the disproportionate tobacco burden shouldered by GM individuals.

FUNDING: Federal

PS2-17

TWO TOBACCO WAYS: BUILDING A TRADITIONAL TOBACCO MOVEMENT IN MINNESOTA

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Commercial tobacco-related disparities continue to exist for communities of color, American Indians and Lesbian, Gay, Bisexual, Transgender and Queer communities. In Minnesota, 60% of American Indians are current smokers compared to 13% of all Minnesota adults. ClearWay Minnesota supports Minnesota's Sovereign Tribal Nations and understands that collaboration is vital to creating optimal change in communities. In 2008, ClearWay Minnesota launched the Tribal Tobacco Education and Policy initiative to address these high rates of commercial tobacco use by emphasizing cultural protective factors, healing, and education around the longstanding history of the special relationship with traditional tobacco. For many years, the use of traditional tobacco was hidden in plain sight to preserve the original intention of the special gift that was given to many American Indians. The ancestral legacy of the tobacco teachings has been a protective factor and continues to be carried through today's generations. This Tribal Tobacco Education and Policy initiative is a comprehensive model grounded in strong relationships between funder and Nations. This model has built a circle of support around the funded tribes, collaboration with other funders, and provided resources for evaluation, training and a mentorship component for tribal project coordinators that is all grounded in the restoration of traditional tobacco. This foundation is based upon traditional tobacco teachings, protocols and stories to create change. This session will describe efforts to support six Minnesota American Indian nations to build a traditional tobacco movement that is responsive to the historical context, culture, resilience, and readiness of their communities. Lessons learned and findings of this ClearWay Minnesota funded initiative will be shared, and will include the passage of over 30 policies over a ten-year period and recommendations for future work in Indian Country.

FUNDING: Nonprofit grant funding entity

**PS2-18****RISKS AND RESILIENCIES AMONG SEXUAL AND GENDER MINORITY OLDER ADULTS ELIGIBLE FOR LUNG CANCER SCREENING**

Andy SL Tan, PhD, MPH, MBA, MBBS. Dana-Farber Cancer Institute.

Background: Sexual and gender minority populations (SGM) are at increased risk of developing lung cancer due to increased smoking and HIV infection prevalence. There is limited research to assess risks and resiliencies associated with intention to participate in lung cancer screening using LDCT among SGM older adults. Without this knowledge, efforts to tailor interventions to promote lung cancer screening in this population will not be possible. Methods: We surveyed a national convenience sample of 139 screening-eligible SGM adults ages 55-80 (138 identified as sexual minority and 6 identified as gender minority). We measured risks and resiliencies informed by the Health Equity Promotion Model: marginalization (harassment, discrimination); sexual identity management (internalized homophobia, disclosure); and psychological (brief resilience scale), social (partnership status, SGM community connectedness), and socioeconomic (education, financial dependence, and household income) resources. We analyzed associations of risks and resiliencies with intentions to participate in lung cancer screening using linear regression models, adjusting for age, sex assigned at birth, sexual orientation, and gender identity. Results: Marginalization, sexual identity management, brief resilience, and SGM connectedness measures demonstrated good internal consistency (Cronbach's alpha ranged from 0.89-0.95) among this sample of SGM older adults. Those who have a Bachelor's degree ($b=0.77, p=0.002$), or Master's degree or higher ($b=0.62, p=0.039$) reported significantly higher intention to participate in lung cancer screening than those with high school and lower education, controlling for other correlates. Marginalization; sexual identity management; psychological, social, and socioeconomic resources were not significant correlates of intention to screen. Conclusion: Higher education attainment is associated with increased intentions to participate in lung cancer screening among eligible SGM older adults. Further research is needed to identify specific risks and resiliencies to inform future tailored health promotion interventions to increase lung cancer screening in this population.

FUNDING: Unfunded

PS2-19**THE UNDERSTATED SMOKEFREE LEADERSHIP OF YOLNGU WOMEN IN EAST ARNHEM LAND, NORTHERN TERRITORY, AUSTRALIA**

Moana Tane, MPH. Menzies School of Health Research.

Significance: Within Yolngu society, leadership is represented in traditional domains and contexts, and these are associated with cultural obligations and duties, with males having a lead role in the performance of the ngarali' [tobacco] manikay (songs) and women participating in the ngarali' [tobacco] bungul (dances). There is a clear line of demarcation between the roles of men and women in these traditional and cultural spaces, and in the interface between mainstream and Yolngu society, specifically in the workplace, women did not often lead tobacco control initiatives. Methods: In-depth qualitative interviews with nine females (six employed by remote health services), among them four current smokers, coding using NVivo 10, thematic analysis using the Framework Method (Gale, Heath, Cameron, Rashid, & Redwood, 2013). Cultural mentors provided interpretation and cultural guidance, with one female and one male mentor giving advice specific to men and women's business. Results: Data was analysed using a priori categories associated with smokefree themes. Participants reported that, irrespective of their own smoking status, all supported their children to avoid smoking and secondhand smoke. All health workers advised their clients to quit smoking as part of their obligations as mothers and/or health workers. Some women participants referenced their roles as 'strong women' and described their repeated efforts to encourage smoking cessation among clients and their extended families. Female participants reported their own smoking cessation attempts, and discussed at length, the challenges that they face in quitting. Conclusion: Extending smokefree leadership in remote communities should include resourcing women to share their knowledge and experience of quitting successfully and encouraging others to make quit attempts. This type of leadership is understated but was effective in raising awareness within families and communities, and is consistent with the cultural norms that the Yolngu uphold.

FUNDING: Academic Institution

PS2-20**MALE PATIENTS' PERCEPTIONS OF STIGMA AND HARNESSING SOCIAL SUPPORT FOR SMOKING CESSATION IN A BEHAVIOR SUPPORT INTERVENTION FOR PATIENTS WITH TUBERCULOSIS IN PAKISTAN AND BANGLADESH**Melanie Boeckmann, Dr. PH, MA, BA¹, Helen Elsey², Anne-Marie Marshall², Omara Dogar², Kamran Siddiqi², Daniel Kotz³. ¹Heinrich-Heine-University Dusseldorf., ²University of York, ³Heinrich-Heine-University DÄ¼sseldorf.

Significance: The dual epidemics of smoking and tuberculosis (TB) contribute to the lung disease burden in Pakistan and Bangladesh. We developed and implemented a smoking cessation behavior support intervention into routine TB care. In these two countries, being confronted with questions on smoking from a health professional may be uncomfortable, and we anticipated challenges for health workers in eliciting smoking status information from their patients. Methods: We conducted a qualitative process evaluation of intervention implementation, conducting semi-structured interviews with eight health workers and 34 male patients with TB at five case study clinics. Here we present findings from a secondary inductive analysis reporting on male patients' statements relating to stigma of tobacco use and of having a TB diagnosis. Findings: Unexpectedly, the majority of male patients in both countries reported that they were fine with disclosing smoking status to their health workers in order to be cured of TB, even if the health worker was female. Our respondents discussed both smoking and often their TB diagnosis with their families, however, disclosing the TB diagnosis was generally perceived as a delicate matter, especially to friends and co-workers. In some cases, this made it difficult to explain the reasons for sudden quit attempts, therefore leading to perceived peer pressure to continue smoking. Conclusions: Male patients in this study were more open to talking about smoking than anticipated, but fear of being stigmatized for having a TB diagnosis led to less disclosure among friends and co-workers. Fewer options to harness social support for quitting may increase risks of relapse in this population.

FUNDING: Nonprofit grant funding entity; Other

PS2-21**A QUALITATIVE DESCRIPTION OF SMOKING, STIGMA AND CULTURE AMONG PREGNANT WOMEN WITH SUBSTANCE USE PROBLEMS IN AUSTRALIA**Melissa Jackson, B Psych (Hons)¹, Penny Buykx¹, Amanda L. Baker², Amanda Brown³, Adrian Dunlop³, Gillian S. Gould¹. ¹The University of Newcastle, ²University of Newcastle, ³Hunter New England Local Health District.

Significance: Women who smoke tobacco and use other substances are a high-risk group characterised by disproportionately high rates of tobacco smoking during pregnancy. They are likely to experience socioeconomic disadvantage, concurrent mental health problems and a history of trauma. A deeper understanding of the experience of prenatal tobacco smoking among this group is needed to develop effective, targeted treatment options. Methods: Interviews were held with tobacco smokers attending two substance use in pregnancy antenatal clinics in NSW, Australia. An exploration of their attitudes towards tobacco smoking and experiences of smoking and cessation while pregnant was undertaken. Results: Qualitative description analysis revealed that this group possess a strong desire to stop smoking and are able to articulate the negative aspects of smoking in terms of their own health and its impact on their children and their social conditions. Smoking is heavily influenced by mental health, boredom, strong nicotine dependence and smoking by partners and others in close social networks. The experience of stigma and feelings of guilt and shame are reported and the need for support to quit identified. Conclusion: The study provides a rich understanding of smoking norms and behaviours among pregnant women attending substance use clinics in pregnancy antenatal treatment services in Australia.

FUNDING: State; Academic Institution

PS2-22**A NARRATIVE REVIEW OF MCESSATION PROGRAMS IN LOW AND MIDDLE-INCOME COUNTRIES**

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Introduction: mCessation (mobile phone-based smoking cessation) programs have a growing evidence base in western contexts and represent a promising treatment option in low and middle-income countries (LMIC). This study aimed to review all published



studies of mCessation programs conducted in LMICs. Methods: We searched PubMed and Scopus for all treatment related mCessation programs published in English using World Bank classification of LMICs. Search terms included: "mHealth, text messaging, SMS, mobile phone, smartphone, digital, social media", and "smoking cessation, tobacco, and cigarette". Information on evaluation design, program development, program features and content, outcomes and measures, and evaluation results was extracted from included articles. Results: Twenty articles were identified, which represented 14 unique mCessation programs from 8 countries (Brazil, China, India, Korea, Mexico, Peru, Turkey and Samoa). Evaluation designs were randomized controlled trials (RCT) (n=8), quasi-experimental (n=2), and non-experimental (n=4). Sample sizes ranged from 15 to 8000. The majority of studies targeted adults (n=12) in urban settings (n=9). Eight programs were newly developed, 3 were adapted from western programs and 3 were missing this information. Thirteen programs were SMS-based and 1 used Whatsapp; half of the programs employed bidirectional messaging. Follow-up end points ranged from 1 to 12 months. Nine of the 10 experimental studies demonstrated higher smoking cessation rates for the intervention group, with 3 studies reporting statistically significant differences. The majority of participants rated these programs favorably across all studies. Conclusions: mCessation programs are feasible and acceptable in LMICs and appear to facilitate smoking cessation. However, larger, adequately powered RCTs with follow-up periods of at least 6 months that biochemically verify smoking status are needed to conclusively establish their efficacy. Future studies need to test these programs across different populations, such as those with low willingness to quit, rural dwellers, users of other tobacco products, and in Africa.

FUNDING: Unfunded

PS2-23

ADAPTATION AND ASSESSMENT OF A TEXT MESSAGE CESSATION INTERVENTION FOR CIGARETTE AND DUAL WATERPIPE AND CIGARETTE USERS IN VIETNAM

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Introduction: Text messaging programs (SMS) can promote cessation. However, effective implementation in low-middle-income countries (LMICs) requires adaptation to local context. We describe the multiphase process of culturally adapting and testing a theory-driven SMS program for Vietnamese tobacco users. Methods: Participants were adult current cigarette-only or dual cigarette/waterpipe users. We conducted 7 focus groups (FGs) with 58 smokers to provide data on culturally relevant patterns of use and to assess message preferences (using a preliminarily adapted SmokefreeTXT library) through a rating task. We then pilot tested (n=40) a 6-week SMS intervention using brief text surveys to obtain real time feedback on messages and conducted post-test interviews (n=10) to inform further adaptation. Finally, we randomized 100 smokers (57% cigarette-only, 43% dual use) to the revised SMS intervention vs weekly text assessments of tobacco use. Carbon monoxide confirmed abstinence was measured at 4 and 12 weeks. Results: FGs informed significant message adaptations including content (e.g., emphasize family support, refusal skills), tone and readability. Participants were largely satisfied with the program (>70%). Few used the bidirectional text function for additional support designed to provide additional tips on cessation. Post-trial participants reiterated preference for messages noted in the FGs, and with additional requests for more practical, action-oriented advice for craving management. They suggested offering phone counseling for more support, tailoring the time for receiving text messages to individual schedules, extending the length of the program, and adding images with text messages. Abstinence rates were higher in the intervention arm than control arm at 4 (20% vs. 2%) and 12 weeks (12% vs. 5.9%). At 12 weeks, cigarette-only smokers reported higher abstinence than dual users. Conclusions: Multiple stages of adaptation are necessary to align SMS interventions with the context-specific psychosocial and cultural factors that influence tobacco use in LMICs like Vietnam. Further adaptation is needed to sustain abstinence outcomes, particularly among dual users.

FUNDING: Federal

PS2-24

IMPLEMENTATION AND ADOPTION OF LARGE-SCALE TEXT MESSAGING FOR SMOKING CESSATION SUPPORT PROGRAMS IN THE UNITED STATES, UNITED KINGDOM AND NEW ZEALAND

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Introduction: Text messaging cessation support is one of the few mHealth initiatives to be translated from research into practice on a large scale and in several different countries. The first programs were established independently with little coordination between programs. This paper outlines the different models of implementation in New Zealand, the United Kingdom (UK) and the United States (US). Methods: Programs were selected based on the following criteria: program was aimed at mCessation, offered on a national scale, and developed prior to 2013. Data was analyzed from the year the program was created through 2016. Metrics for evaluation were based on the RE-AIM framework and included the history of program development, reach, implementation and maintenance. Results: Four programs were identified: Text2Quit (US), SmokefreeTXT (US), Txt2Quit (NZ) and Txt2Stop (UK). Programs were established between 2008 and 2012. Programs were originally developed at universities with service providers and then licensed (NZ, US) or developed within government agencies (UK, US). Entities running the service included the government (UK), a government funded contractor (US, NZ), and a for profit health services company (US). Subscribers were enrolled through a variety of methods including through calls to the quitline, by SMS, and on a website. The average number of annual subscribers to each program ranged from 3,476 (NZ) to 66,774 subscribers (UK). The percent of adult smokers reached in the country was less than 1% across programs. In one country (NZ) the program was discontinued after 5 years, while in the remaining 3 countries the programs are currently offered. Challenges to maintenance of the programs include competing priorities. Conclusions: Lessons from experiences of these programs may inform current and new initiatives in countries considering national adoption, as well as initiatives aimed at other types of health behaviors.

PS2-25

DEVELOPMENT AND PILOT TESTING OF A WECHAT SMOKING CESSATION INTERVENTION FOR CHINESE MALE SMOKERS

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Significance: China has 316 million smokers, only 17.6% of whom intend to quit smoking within the next 12 months. With the exponential increase in mobile Internet users in China, mobile health (mHealth) based approaches offer unprecedented opportunities for cost-effective dissemination of smoking cessation interventions. We describe the development and pilot testing of a culturally adapted mHealth smoking cessation intervention for Chinese male smokers delivered via WeChat, a ubiquitously used app in China. Methods: Eight focus groups (47 adult Chinese male smokers) and six in-depth interviews (key informants including health professionals and China CDC tobacco control experts) were conducted in Shanghai, China to inform cultural adaptations. Qualitative analyses were conducted with NVivo. The WeChat intervention was developed using intervention mapping, guided by the transtheoretical model and theory of mindfulness for treating addiction. Messages from existing mHealth programs were adapted to be culturally appropriate and understandable. One hundred adult Chinese male smokers have now enrolled in a pilot clinical trial of the culturally adapted WeChat smoking cessation program. The intervention lasts 12 weeks, and 7-day and 4-week abstinence, smoking stage of change, and quit attempts are assessed immediately post-treatment and at 1- and 6-month follow-ups. Results: Qualitative results suggested that smokers preferred WeChat (vs. other mHealth platforms), practical smoking cessation skills (which could include mindfulness for stress management), and personalized and interactive messages. In the pilot study, 82.3% of subscribers in our WeChat platform understood most of the messages, 90.0% reported that the message content was acceptable, and 81.4% reported that the messages made them think about quitting smoking. Pilot study outcomes will also be presented. Conclusions: WeChat may be an acceptable modality for delivering smoking cessation interventions in China. We will discuss our process of cultural adaptation, lessons learned, and future directions for improving the WeChat intervention.

FUNDING: Federal



PS2-26

ENDS USE TRAJECTORIES FROM 2014-2019: EXAMINING THE EFFECTS OF POD-MOD E-CIGARETTES.

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Current e-cigarette (ENDS) use by US high school students increased from 1.5% in 2011 to 20.8% in 2018. This growth in prevalence was not a steady linear increase; current use among teens increased 78% between 2017 and 2018. One reason for the recent surge in ENDS use among young people is the appearance of vape pod systems, like JUUL, on the market. The goal of this study is to investigate the trends in the growth of ENDS among youth and young adults and how those trends were disrupted with the changing e-cigarette marketplace. Data are from the Truth Longitudinal Cohort (TLC), an eight-wave, probability-based, nationally representative cohort, aged 15-to-21 years at baseline. Participants who had never used tobacco at baseline and participated in at least one later wave were included in the analysis ($n = 7,207$). A logistic piecewise latent growth curve model (LPW-LGCM) was conducted to estimate two interrelated slopes, reflecting growth on current ENDS use both before and after the introduction of pod-mods to the market. Slope 1 reflected the growth in proportion of current ENDS use from Winter/Spring 2015 (wave 2) to Winter/Spring 2016 (wave 4); slope 2 reflected the growth in proportion of use from Summer/Fall 2016 (wave 5) to Winter/Spring 2019 (wave 8). LPW-LGCM results suggest that there are differences odds of current ENDS use over time, before and after the introduction of pod-mods to the market. From wave 2 to wave 4, the growth estimate was not statistically significant, indicating no difference in the odds of current ENDS use vs. no current ENDS use ($OR = 1.53, P = 0.291$); however, from wave 5 to wave 8, the growth estimate shows that as time increased, the odds of currently using an ENDS product was approximately 2 times the odds of not currently using an ENDS product ($OR = 2.03, p < 0.001$). This study describes the explosive growth in ENDS use since the summer of 2016 and demonstrates the disruptive influence of pod-mods on the ENDS marketplace. Future analysis will include parallel process growth mixture modeling to investigate how co-use of cigarette and ENDS products differ over time for various classes of youth and young adults.

FUNDING: Other

PS2-27

RELATIONSHIPS BETWEEN LONGITUDINAL TRAJECTORIES OF ENDS, MARIJUANA, AND ALCOHOL USE AMONG TEXAS ADOLESCENTS

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Introduction. Few studies have investigated stable trajectories of ENDS use among young people across an extended period of time (e.g., >1 year). It is also unknown if and how these trajectories of ENDS use might be related to marijuana and/or alcohol use in adolescence. Methods. Longitudinal analysis of population-based surveys from the Texas Adolescent Tobacco and Marketing Surveillance System [TATAMS] (8 bi-annual waves across 4 years, 2014-18; $n=3907$, $N=461,069$). Growth mixture models (GMMs) were applied to identify stable patterns in trajectories of ENDS use, from 11 to 19 years of age. Two measures of ENDS use were used: (a) an index of susceptibility, ever use, and past 30-day use, combined ($n=3907$); and (b) past 30-day use, alone ($n=765$). Once enumerated, differences in past 30-day marijuana and alcohol use from 11 to 19 years of age were examined by ENDS use trajectory. Results. Seven stable trajectories of ENDS use were identified using the index of combined measures, while four stable trajectories of ENDS use were identified using the measure of past 30-day use alone. For example, among adolescents who reported any past 30-day ENDS use at any wave ($n=765$), stable trajectories of past 30-day ENDS use included: (a) early escalators (30%), whose past 30-day use started at age 14; (b) mid-escalators (34%), whose past 30-day use started at age 15.5; (c) late escalators (30%), whose past 30-day use started at age 17; and (d) decliners (6%), whose past 30-day use peaked at age 15. The frequency of ENDS use (i.e., past 30-day use) exceeded the frequency of marijuana and alcohol use at each age. Marijuana and alcohol use increased in frequency as adolescents aged and were most problematic among those who started ENDS use early, at or before 15 years of age. Conclusion. Longer-term studies with frequent observations can be used to identify stable trajectories of ENDS use across adolescence. The frequency of marijuana and alcohol use varies in important ways across these trajectories and appears to be most problematic among those who start using ENDS products early in adolescence, at or before 15 years of age.

FUNDING: Academic Institution

PS2-28

PREDICTORS OF ENDS USE TRAJECTORIES ACROSS YOUNG ADULthood

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Young adults have the highest prevalence of Electronic Nicotine Delivery Systems (ENDS) use. Although the maturing out hypothesis indicates that ENDS use may decline in the transition to adulthood, there are few long-term longitudinal young adult ENDS use studies. This study examined longitudinal changes in ENDS use from ages 18-28 and the role of intrapersonal and interpersonal factors in these changes. Method: Data were from a six-wave 24-college study in Texas. Baseline data were collected in 2014-2015 and every six months thereafter. Participants were 2,707 students who were 18-25 years old at Wave 1 ($M=20.29$; $SD=1.89$) and 20-28 at Wave 6 (59.2% female; 36.5% non-Hispanic white, 33.4% Hispanic, 30.1% other race/ethnicity). Growth curve models for an accelerated design were fit to assess changes in current/past 30-day ENDS use across ages 18-28. Wave 1 time-invariant independent variables (IVs) were: sex, race/ethnicity, ever cigarette use, family-of-origin tobacco use, ENDS use susceptibility, and peer ENDS use; time-varying IVs assessed at each wave were: age and current cigarette use. Two-way interactions between age and each IV were tested to determine if the intrapersonal and interpersonal IVs predicted changes in ENDS use across increasing age. Results: There was a significant decline in ENDS use from ages 18-28 ($b = -1.81, p < .001$). There were significant main effects for participant sex and all intrapersonal and interpersonal IVs ($p < .05$). Males, those susceptible to ENDS use, who smoked cigarettes, had a denser family history of tobacco use, and more ENDS-using peers had a higher probability of ENDS use. There were two significant two-way interactions: age x ENDS use susceptibility ($b = -0.44, p < .01$) and age x peer ENDS use ($b = -0.49, p < .01$). Those susceptible to ENDS use and those with more ENDS-using peers were more likely than their counterparts to use ENDS at age 18 (and across all ages), but showed a more rapid decline in use across increasing age. Conclusion: Findings are consistent with a maturing out hypothesis and indicate that intrapersonal and interpersonal factors play an important role in young adults' ENDS use trajectories.

FUNDING: Academic Institution

PS2-29

NICOTINE DEPENDENCE AMONG YOUTH E-CIGARETTE USERS

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Background: Adolescents' and young adults' (AYA) use of e-cigarettes has dramatically increased. While anecdotal and some scientific evidence exists on youth e-cigarette dependence, we lack detailed and longitudinal data on nicotine dependence among e-cigarette versus cigarette users. Methods Data were collected from 2014 to 2019 (7 waves) from a convenience sample ($N=900$ 9th and 12th graders) recruited from high schools in California with racially/ethnically and socioeconomically diverse populations. Participants (64.8% female; 38.8% "white," 23.9% each "more than one race" and "Asian," 13.5% other; 36.9% Hispanic) completed an online survey on tobacco product use and dependence using the Hooked on Nicotine Checklist (HONC), a 10-item questionnaire. Endorsement of any symptom on the HONC indicates nicotine dependence. Results Using combined data from Waves 1-7 ($n=945$), 30.9% of participants who had ever used any e-cigarette product ($n=392$) and 36.2% of participants who had ever used JUUL ($n=116$) indicated they were nicotine dependent. Among e-cigarette users, the percentage of participants who showed nicotine dependence climbed from 16.1% ($n=23$ positive HONC score/143 e-cigarette ever-users) in Wave 1 to 35.8% ($n=69/193$) by Wave 7. In preliminary univariate logistic regression, the odds of nicotine dependence compared to traditional cigarette ever-users was 48% lower for e-cigarette ever-users ($OR: 0.52, 95\% CI: -0.35-1.40$) and 74% higher for combined traditional cigarette and e-cigarette ever-users ($OR: 1.74, 95\% CI: 0.91-2.58$), although these results were non-significant and require further adjustment. Conclusions Our preliminary findings suggest that self-reported symptoms of nicotine dependence among youth e-cigarette users increased over time, with more Juul than other e-cigarette users reporting dependence. Of particular risk are those using both e-cigarettes and cigarettes.

FUNDING: Federal; Academic Institution



PS2-30

E-CIGARETTES AND SMOKING CESSATION: A PROSPECTIVE STUDY OF A NATIONAL SAMPLE OF PREGNANT SMOKERS

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Introduction: Smoking during pregnancy has adverse health consequences for the mother and fetus. E-cigarettes could aid with smoking cessation but there is limited research on the prevalence and patterns of e-cigarette use, and their association with smoking cessation among pregnant smokers. **Methods:** We conducted a secondary analysis of a randomized controlled trial of a text-messaging program for smoking cessation among a U.S. national cohort of pregnant smokers (n=428). Outcomes assessed were trajectories of e-cigarette use from baseline to one-month follow-up, and longitudinal association between e-cigarette use at baseline and smoking cessation at one-month follow-up. **Results:** At baseline, 74 (17.29%) pregnant smokers used e-cigarettes in the past 30 days and 36 (8.41%) used e-cigarettes in the past 7 days. In this sample, the primary reason for using e-cigarettes during pregnancy was for quitting. E-cigarette use between baseline and one-month was inconsistent. Of 36 dual-users at baseline, 20 (55.56%) stopped using e-cigarettes by one-month follow-up and 14 initiated e-cigarette use. There was no evidence of an association between e-cigarette use at baseline and the primary smoking cessation outcome, 7-day point prevalence abstinence [adjusted odds ratio=0.79, 95% confidence intervals=0.33-1.92]. **Conclusions:** A secondary analysis of a national trial of pregnant smokers provides some indication that use of e-cigarettes to quit smoking may be common in pregnant smokers but found no association with improved smoking cessation outcomes. There is an urgent need to further examine the risk and benefits of e-cigarette use, especially during pregnancy.

FUNDING: Federal

PS2-31

SMARTPHONE-BASED FINANCIAL INCENTIVES TO PROMOTE SMOKING CESSATION DURING PREGNANCY

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Cigarette smoking during pregnancy increases risk for pregnancy complications, adverse fetal and infant health problems, and later-in-life chronic conditions among exposed offspring. The most effective intervention for reducing smoking during pregnancy is a behavioral economic model wherein participants earn incentives contingent on objective evidence of smoking abstinence. However, incentive-based interventions are typically delivered in relatively intense protocols requiring frequent clinic visits, limiting the geographical range over which services can be delivered and potentially denying treatment to those in remote settings. The present study examines the feasibility, acceptability, and preliminary efficacy of a smartphone-based incentives intervention whereby smoking monitoring and delivery of incentives are completed remotely using a mobile app. Pregnant women are recruited via obstetrical clinics, WIC offices, and Facebook advertising. Eligible participants are randomized to either an incentives condition wherein they earn financial incentives contingent on the remote submission of breath and saliva specimens indicating smoking abstinence, or a control condition wherein women receive current best practices for smoking cessation. Sixty women (30 incentives, 30 control) were enrolled in the trial. They were predominantly White (72%), ~30 years of age, unemployed (60%) and having < 12 years of education (70%). Abstinence rates 1 month after enrollment were significantly greater among Incentives (47%) versus Control participants (20%), $\chi^2 = 4.80, p < 0.05$. A higher proportion of Incentives participants were also abstinent at a late pregnancy assessment (> 28 weeks gestational age) (37%) versus Control participants (14%), $\chi^2 = 4.07, p < 0.05$. The treatment appears to have high acceptability, with most women rating the program as fair, fun, convenient, and easy to use. The data to date are promising in terms of supporting the feasibility, acceptability, and preliminary efficacy of the present smartphone-based financial incentives program for promoting smoking cessation during pregnancy.

FUNDING: Federal

PS2-33

COMMUNITY SMOKING CESSATION TREATMENT FOR DISADVANTAGED MEDICAID BENEFICIARIES: ESTIMATED COSTS AND PROJECTED HEALTH CARE SAVINGS

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Medicaid is the primary health insurer of low-income populations; an estimated 11% of expenditures are attributable to smoking. Community clinics serve millions of Medicaid beneficiaries with serious mental illness (SMI) who are 2-3 times more likely to smoke and less likely to quit than people without SMI. Motivational interventions increase use of cessation treatments, and abstinence incentives can increase their efficacy. According to Glantz (2019), reducing the smoking prevalence of this population by 2-4% would lead to a median \$25 million savings in state health care costs in the following year (\$53 million for New Hampshire). However, these estimates did not consider time and costs of implementing and engaging smokers into a cessation program. We delivered a motivational intervention to all interested smokers and enrolled participants in a randomized trial assessing three tailored community cessation treatments with or without abstinence incentives across an entire state mental health system, 2012-2015. We assessed biologically verified abstinence at baseline, 3, 6, 9 and 12 months. We estimated costs of cessation treatment (behavioral and pharmacotherapy interventions) in relation to the estimated health care savings. 1500 smokers (37.5% of the estimated 4000 smokers with SMI) received web-based motivational education. 661 (16% of smokers) were randomly assigned to a cessation intervention over 3 years. At the 12-month assessment, 12% of the study group assigned to community treatments with incentives achieved biologically verified abstinence (~2% of smokers in the mental health system). Estimated yearly costs for the treatment program were \$558,000 for Medicaid recipients with SMI and \$6,975,000 for the entire state Medicaid program. Based on estimated savings according to Glantz (2019), the state could gradually reduce smoking-related health care spending up to \$28,005,000 in the 4th year of the program. These cost estimates indicate that even with significant investment to implement a cessation program tailored for disadvantaged smokers, substantial savings could be gained through reduced health care costs.

FUNDING: Federal

PS2-34

NRT SAMPLING AND SELECTION TO IMPROVE MEDICATION ADHERENCE: RESULTS OF PILOT TRIAL

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Medication adherence to smoking cessation pharmacotherapy is critical for success, increasing quit rates up to fourfold over non-adherent smokers. However, most cessation attempts occur without the use of pharmacotherapy leading to failure and demoralization. Even among users of medication, 69% prematurely quit use of medication, and only 36% achieve optimal adherence (use of 80% of prescribed doses). Rates of non-adherence to NRT are particularly high with approximately 76% prematurely discontinuing their medication. Only a few studies have targeted adherence to smoking cessation medications. These studies have primarily tested brief psychoeducational interventions, yielding increases in intentions to use and self-reported adherence, but with no behavioral change, i.e., actual smoking cessation. However, more direct experience with medication, i.e., through actual product sampling, has been found to increase adherence. For this pilot (N=80), we developed a novel intervention to have low income smokers sample NRT in session and discuss their real time experience and perceptions of it. Over the course of four weeks, smokers sampled in guided sessions four different short-acting NRT products (gum, lozenge, inhaler, nasal spray), each in conjunction with the nicotine patch. Following each session, participants were given a weekly sample of the assigned product to use at home for practice quit attempts. At week five, after having sampled all short-acting NRTs, participants selected their product choice, again with added nicotine patch, to use for a quit attempt. Control participants received four standard smoking cessation sessions and then selected their short-acting NRT product to use with patch based on pictures with written descriptions during week five. An additional 8 weeks of medication was provided to all participants to make quit attempts. We will present results of this newly completed trial and examine rates of adherence and cessation.



Previous pilot work of this intervention demonstrated in-session guided use of NRT increases adherence and quit attempts after session compared to control participants given standard behavioral counseling combined with NRT.

FUNDING: Federal

PS2-35

EVALUATION OF A NOVEL TOBACCO TREATMENT FOR CERVICAL CANCER SURVIVORS: PRELIMINARY FINDINGS FROM AN ONGOING RANDOMIZED CONTROLLED TRIAL

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Smoking prevalence is high among cervical cancer survivors, with national rates approaching 50%. Thus, it is critically important that survivorship care planning include the delivery of tobacco treatment designed to address the specific treatment needs of this population. This presentation describes the preliminary results of an ongoing RCT designed to evaluate the efficacy of a theoretically- and empirically-based Motivation And Problem-Solving (MAPS) approach to facilitating smoking cessation. MAPS is a comprehensive, dynamic, and holistic intervention that incorporates empirically supported cognitive behavioral and social cognitive theory-based treatment strategies within an overarching motivational framework. MAPS was designed to be appropriate for all smokers regardless of their motivation to change, and views motivation as dynamically fluctuating from moment to moment throughout the behavior change process. Participants are randomized to Standard Treatment (ST) or MAPS+ST. ST consists of a mailed packet of materials including a state quitline referral, free nicotine replacement therapy when ready to quit, and standard self-help materials. ST is mailed a total of 3 times (baseline, 6 and 12 months). MAPS consists of ST + 6 proactive phone counseling sessions delivered over 12 months. To date, 155 participants have been randomized (ST=77; MAPS=78). Mean age is 47.3, and participants are predominantly non-Hispanic white (73%). Nearly half (44%) have an annual household income <\$20,000. Approximately 13% have less than a high school education; 30.2% high school diploma/GED; 47.5% some college. Mean years of smoking is 28.2; 35.3% smoke within 5 minutes of waking; mean cigarettes per day = 14.8. Preliminary abstinence data (intent-to-treat) among participants who have reached each follow-up assessment point reflect an approximate doubling of abstinence at 12 months [3 months (n=106): ST=15%, MAPS+ST=11%; 6 months (n=57): ST=19%, MAPS+ST=27%; 12 months (n=33): ST=17%, MAPS+ST=40%]. Findings to date are encouraging and provide preliminary support for the utility of MAPS in facilitating cessation within a vulnerable and difficult to reach population of smokers.

FUNDING: Federal

PS2-36

AFRICAN-AMERICAN DISPARITIES IN TOBACCO PRODUCT USAGE ACROSS INSTITUTIONS

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Significance: African Americans (AA) disproportionately suffer from tobacco-related health disparities and are targeted by tobacco companies. Although AA typically use tobacco products (TP) at a lower rate in adolescence, there is a later increase in use, where AAs smoking rates are similar to other racial groups. Potential sociocultural explanations for TP use disparities by AA could benefit from examination of use across various settings. Methods: Participants were aged 18-24 (n=2296) attending attended community college (CC, 26%), a historically black college or university (HBCU, 27%), or a 4-year predominantly white institution (PWI, 47%). E-cigarettes (EC) were the most commonly used tobacco product (49.9%), followed by little cigars (LC, 43.7%), hookah (42.6%), and cigarettes (35.8%). Multivariate regressions examined age, gender, race, institute, and number of TP used as independent correlates of first products used and lifetime usage. Results: AA were less likely to have ever used any TP (AOR:0.8, 95%CI:0.7-0.99), whereas PWI (1.4, 1.1-1.7) were more likely. Race and institute (AA, 0.6, 0.5-0.8; HBCU, 0.5, 0.4-0.8) were correlated with lower EC ever-use. AA correlated with LC as first TP (1.7, 1.3-2.3); AA (1.8; 1.3-2.4) and HBCU (2.1; 1.4-3.1) correlated with LC ever-use. AA correlated with hookah (1.8; 1.4-2.3) and cig (0.6, 0.4-0.8) as first TP. Compared to CC, HBCU (2.2; 1.5-3.1) and PWI (1.5; 1.1-2.0) students were more likely to initiate with hookah rather than cig (HBCU, 0.4, 0.3-0.6; PWI, 0.7, 0.5-0.9). AA and HBCU correlated with hookah (AA, 2.1, 1.6-2.8; HBCU, 2.0, 1.4-3.0) and cig ever-use (0.4, 0.3-0.6; 0.5, 0.3-0.7). Conclusion: Results indicate that little cigars and hookah

are the predominant tobacco products among African Americans, while cigarettes and e-cigarettes are less prominent. Four-year institution attendance was associated with increased smoking initiation via hookah. Finding support the need for the extension of regulatory tools to non-cigarette combustible tobacco products.

FUNDING: Federal

PS2-37

EFFECTS OF ELECTRONIC CIGARETTE AD CHARACTERISTICS AND LIQUID/DEVICE FEATURES ON BEHAVIORAL ECONOMIC ABUSE LIABILITY INDICES

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Behavioral economic models of abuse liability play a pivotal role in assessing the efficacy of policies aimed at influencing tobacco use behavior. To illustrate the flexibility and utility of behavioral indices of abuse liability to inform policy-making for e-cigarettes (ECs), findings from a field experiment among youth and lab study among adults are described. In the field experiment, 1360 adolescents were randomly assigned to view 1 of 4 EC advertising (ad) themes (general, flavor/taste, youth/people, control) followed by an EC purchase task (EPT). In the lab study, adult daily exclusive EC or dual EC/cigarette users completed five in-person sessions (current N=9, target N=120 by 8/2020). The first four sessions varied by protonated nicotine concentration (10 vs. 30 mg/ml) and device power (15 vs. 30 Watts [W]) using a 2X2 design. The fifth session was their own brand (OB) EC/cigarette. Session measures included the multiple choice procedure (MCP), progressive-ratio task (PRT), EPT, and cross-product purchase task (CPPT). Statistical models for the field experiment tested differences between EC ad conditions and covariates predictive of EC demand, and for the lab study, differences between EC conditions and OB were examined (p<0.05). Field experiment findings indicated that prior ad exposure but not EC ad theme assignment was positively associated with EC price responsiveness. Among youth who were price-responsive, EC demand was significantly higher among those exposed to flavor/taste and people/youth themes relative to control. In the lab, no significant between condition differences were observed for the MCP, PRT and EPT indices, but descriptively the 10 mg/ml+30 W condition was the most highly preferred compared to other EC conditions. The CPPT indicated that each EC condition functioned as a substitute for OB, and demand for the 10 mg/ml+30 W condition was significantly more responsive to changes in OB prices than the 30 mg/ml+15 W condition. This evidence suggests that EC demand is influenced by EC ad characteristics and liquid/device features, which policies interested in changing tobacco use behaviors could target.

FUNDING: Federal; State

PS2-38

MEDIATING ROLES OF FAMILY SMOKING, PARENTAL CONTROL, AND PARENTAL PERMISSIVENESS IN SOCIAL PATTERNING OF ADOLESCENT SMOKING IN INDONESIA

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Introduction: Family characteristics may indicate social inequality in adolescent smoking, but are not modifiable risk factors that can be comprehensively incorporated in anti-smoking prevention. This study quantified 1) the association between family characteristics and adolescent smoking in Indonesia and 2) the mediating role of the family smoking environment (family smoking status, parental control, and parental permissiveness) in this association. **Methods:** A cross-sectional survey was conducted in eight Indonesian cities among 2,661 students aged 13 to 18 years old. Multilevel logistic regression was used to estimate the association between family characteristics (parent's educational attainment, wealth, and religion) and adolescent smoking. Mediation analysis via Generalized Structural Equation Modelling (GSEM) quantified how much family smoking status, parental control, and parental permissiveness of smoking mediated these associations. Analyses were stratified by gender. **Results:** Smoking prevalence was 53.2% among boys and 7.7% among girls. Wealthier communities had a significant higher chance of smoking in girls (wealthier vs poorer: OR 0.49, 95%CI 0.28-0.89), but were not significant in boys. Smoking was negatively correlated with Christian boys (OR 0.56, 95%CI 0.35-0.89) and Buddhist-Hindu girls (OR 0.23, 95%CI 0.05-0.97) compared to Muslims. The odds of smoking in parental education were



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much higher in boys, but were not significant (high vs low: OR 1.46, 95%CI 0.95-2.24). Several variables in parental control and parental permissiveness mediated effects of family characteristics on smoking in boys and girl. Father and brother smoking status mediated these associations only in boys. **Conclusions:** Our study demonstrates that wealthier girls were more likely to smoke and factor of religions towards smoking differed in both genders. The family smoking environment was also important in social patterning of adolescent smoking. Anti smoking prevention targeting Indonesian adolescents is suggested to involve parent's role to prevent adolescent smoking.

FUNDING: Unfunded

PS2-39

CREATIVE CONCEPT TESTING AMONG ADULT CIGARETTE SMOKERS AND DUAL USERS USING A MIXED METHODS APPROACH

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SIGNIFICANCE: CDC's *Tips From Former Smokers*® (*Tips*®) national tobacco education campaign has been on air annually since 2012. The campaign profiles real people who are living with serious long-term health effects from smoking and secondhand smoke exposure. The original campaign development process in 2011 was comprised of a rigorous formative research design that included creative concept testing, an activity that evaluates participants' reactions to a concept prior to the production of an advertisement. In 2017, CDC tested four concepts (*Taking Care*, *Tips*, *Smoking Ironies*, *Stronger Than You Think*) with adult cigarette smokers and dual users of both cigarettes and e-cigarettes to assess whether any variations in impact existed with regard to key measures. The four concepts each took a distinct approach to encourage smokers to quit. **METHODS:** Qualitative data were collected through 12 focus groups in three cities (n=114). Groups were segmented by tobacco use status and age. Quantitative data were collected using a convenience sample (n=11,694) of adult online panelists aged 18-54 years. Key measures assessed during testing included message comprehension, perceived effectiveness (PE), believability, confusion, and whether the concepts motivated smokers to quit. **RESULTS:** Quantitative results showed PE scores for all the creative concepts tested with participants were above 3.6 (on a scale from 1 to 5) with *Taking Care* (3.9) and *Tips* (3.8) receiving the highest PE scores. A higher proportion of cigarette smokers (65%) reported that *Taking Care* motivated them to quit smoking compared to *Stronger Than You Think* (47%; p<.01). *Taking Care* motivated the most dual users to want to quit smoking cigarettes (87%) followed by *Tips* (83%) and *Smoking Ironies* (79%). All focus group participants reported being motivated to quit smoking after viewing *Taking Care* and *Tips*. **CONCLUSION:** Both the *Tips* and *Taking Care* concepts tested high in a variety of key measures among both smokers and dual users. These findings can help inform future advertisement development for *Tips*, as well as other mass reach health communication campaigns.

FUNDING: Federal

PS2-41

MPOWER AND HOUSEHOLD TOBACCO CONSUMPTION - A TALE OF TWO EDUCATIONAL GROUPS

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Since the ratification of the World Health Organization Framework Convention on Tobacco Control (FCTC) in 2004, Pakistan has made modest but continued progress in implementing the WHO MPOWER measures. By 2014, substantial progress was achieved in areas of monitoring, mass media anti-tobacco campaigns, and advertising bans. However, the findings from the 2014 Global Adult Tobacco Survey (GATS) of Pakistan show significant differences in anti-tobacco campaign exposure among individuals of different educational attainment. Given this large variation in noticing anti-tobacco information, this paper analyzes how heterogeneity in treatment exposure (by education group) may impact household level tobacco-use prevalence. Using household level data from 2011-12, 2013-14, and 2015-16 cohorts of the Household Integrated Economic Survey, we first estimate the changes in share of tobacco-user households for two educational groups - primary or no education and higher than primary. Next, we analyze data from the 2014 GATS to generate evidence on differential exposure of anti-tobacco campaign across educational groups. Finally, using the differential exposure to anti-tobacco campaign, we estimate the effect of the MPOWER implementation on household level tobacco-use prevalence with a difference-in-differences model. We find that progress made in MPOWER implementation in 2014 in Pakistan is associated

with 3.1 percentage point reduction in the household level tobacco-use prevalence in 2016. However, the reduction in tobacco-use varied widely across households of different educational attainment. Analysis of the 2014 GATS data revealed that, on average, individuals with higher than primary education are 23 percentage points and 12 percentage points more likely to notice anti-cigarette and anti-smokeless tobacco information in 2014, respectively. Subsequently in 2016, households of higher education experienced 3.6 percentage points reduction in tobacco-use prevalence compared to the low education group. This findings suggest that differences in educational attainment may be considered when developing population level policies of inclusive and effective tobacco control measures.

FUNDING: Unfunded; Federal

PS2-42

ANALYSIS OF URINARY BIOMARKERS OF EXPOSURE TO VOLATILE ORGANIC COMPOUNDS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY (WAVE 1) -CHARACTERIZATION OF TOBACCO PRODUCT EXPOSURE

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Significance: Volatile organic compounds (VOCs) are ubiquitous in the environment. Long-term exposure to certain VOCs may increase the risk of cancer, heart disease, and birth defects. In the United States (US), tobacco use is the major non-occupational source of exposure to a number of harmful VOCs (e.g., acrolein, acrylonitrile, benzene). We measured VOC metabolites in adult tobacco users and non-users. **Methods:** The Population Assessment of Tobacco and Health (PATH) Study is a national longitudinal study of civilian non-institutionalized youth and adults in the United States that examines tobacco use patterns, attitudes, and related health outcomes. We measured VOC metabolites (VOCM) in urine samples collected from a subset of adult (ages 18+) tobacco users and non-users in Wave 1 (2013-2014). We analyzed data for 20 VOCM (18 parent VOCs) from 11,501 PATH Study Wave 1 urine samples to better characterize and compare VOC exposures among users of different tobacco products and non-users. Three classes of tobacco product use were defined as follows: combustible products (e.g., cigarettes, cigars, cigarillos, little filtered cigars, pipe, hookah); e-cigarettes, and smokeless products (e.g., loose snus, pouched snus, chewing tobacco, dip, snuff, spit, dissolvable tobacco). **Results:** Unweighted creatinine-adjusted urinary levels of VOCM from exposure to acrolein, crotonaldehyde, isoprene, acrylonitrile, and 1,3-butadiene were significantly higher in exclusive combustible tobacco product users (N=3,156) than in exclusive e-cigarette users (N=149) and exclusive smokeless tobacco product users (N=353) for all assayed VOCM when compared to non-users of tobacco (N=1,563). **Conclusions:** We found combustible tobacco product users had higher VOCM concentrations than exclusive e-cigarette users, exclusive smokeless tobacco product users, and non-users of tobacco products. Urinary VOCM data can be used to establish a baseline of exposures to VOCs to identify exposure trends as a result of changes in combustible tobacco use over time.

FUNDING: Federal

PS2-43

USE OF SMOKELESS TOBACCO IN BANGLADESH, INDIA, AND PAKISTAN: FINDINGS FROM THE GLOBAL ADULT TOBACCO SURVEY

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Background Tobacco use causes over 8 million deaths globally each year, and around 80% of those who smoke live in low- and middle-income countries. Other forms of tobacco use, including smokeless tobacco (SLT), also pose a significant health threat, such as oral cancer and dental diseases. SLT use is prominent in Bangladesh, India, and Pakistan, who share geographical proximity, but the correlates of SLT use is under-examined. Hence, we assessed the prevalence and patterns of SLT use in these countries. **Method** We analyzed data from the Global Adult Tobacco Survey, a household survey of persons aged ≥15 years. Data for Bangladesh, India, and Pakistan were collected during 2014-2017; sample sizes were 12,783, 74,037, and 7,831, respectively. Current users of SLT (for nasal or oral use) were respondents who reported using SLT daily or



less than daily at the time of survey. We calculated the prevalence of overall tobacco and SLT use by selected socio-demographic variables. Multivariate logistic regression was used to assess correlates of SLT use, including sex, age, education, urbanicity, and tobacco smoking status. **Results** Overall tobacco use prevalence was 35.3% in Bangladesh, 28.6% in India, and 19.1% in Pakistan. Overall SLT use was 20.6% in Bangladesh, 21.4% in India, and 7.7% in Pakistan. Concurrent use of smoking tobacco and SLT was low, ranging from 5.3% to 12.0%. In Bangladesh (49.1%) and India (62.7%), a great percentage of tobacco users used SLT only. The most commonly used form of SLT was oral tobacco; prevalence was 20.6% in Bangladesh, 21.0% in India, and 7.3% in Pakistan. In Bangladesh, women had greater odds of using SLT; in India and Pakistan, odds were greater among men. In all three countries, older adults had greater odds of using SLT compared with those aged 15-25 years; those with less education had higher odds of SLT use. **Conclusion** SLT comprises a large portion of overall tobacco use in Bangladesh, India, and Pakistan. In Bangladesh and India, SLT use was higher than tobacco smoking. Given the adverse health consequences of SLT, it is important that tobacco control strategies address all forms of tobacco use, including SLT.

FUNDING: Nonprofit grant funding entity

PS2-44

THE IMPACT OF THE TOBACCO REDUCTION PROJECT IN PEOPLE LIVING WITH HIV ON THEIR SMOKING BEHAVIOR: A PRE AND POST COMPARISON STUDY IN MICHIGAN, 2017

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ABSTRACT Background: HIV disease has changed from fatal to a manageable disease due to the advances in medical treatment. People Living With HIV (PLWH) are now facing diseases similar to the general population. Smoking is among the most prevalent problems. They are dying 12 years sooner from tobacco related illness than from AIDS complications. In Michigan, according to our first survey study in 2015 the smoking rate among PLWH was 49.5%. **Methods:** Michigan Tobacco Control Program contracted with 14 AIDS Service Organizations to improve health outcomes of their HIV positive clients. Concentrated training that focused on tobacco treatment and motivational interviewing was conducted to staff to build internal agency capacity. We assessed the staff and client's knowledge, attitude and behaviors on tobacco use to have baseline data. Second HIV client survey after more than 2 years from the project was conducted to assess the impact and progress made. **Results:** The 2017 study revealed that the current smoking rate among PLWH is 41%. The highest rate was found among the 35-44 years age group. Black Americans HIV clients smoke at higher level (51%) than white. **Conclusion:** A significant reduction in smoking rates among PLWH (41%) compared to 2015 baseline of 49.5%. We also found a significant reduction in smoking rates within male gender, of 35 years old and above, with some college and above and within LGBTQ group compared to 2015. Studying the quitting behavior, we found that quitting through counseling, and using quit classes were significantly higher than 2015 baseline data.

FUNDING: Federal

PS2-45

IS E-CIGARETTE USE A GATEWAY FOR LATER CIGARETTE USE IN YOUNG ADULTHOOD? A PROPENSITY SCORE ANALYSIS

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Introduction: The recent surgeon general's report has identified a need for longitudinal data to examine the harm that e-cigarette use could pose to never smokers. Moderate evidence exists that, for youth and young adults who are nonsmokers, e-cigarette use could lead to smoking combustible cigarettes; however, it is still unclear whether some e-cigarette users would have gone on to use combustible tobacco anyway. This study provides a rigorous test of whether e-cigarette use initiation can lead to the use of tobacco cigarettes among young adults. **Method:** Data are drawn from the Community Youth Development Study (CYDS), a community-randomized trial of the Communities That Care prevention system that has followed 4,407 youth from 24 small communities in seven states (Colorado, Illinois, Kansas, Maine, Oregon, Utah, and Washington) since 2003. Youth have been surveyed annually at ages 10 to 16, and again at 18, 19, 21, and 23. Tobacco was measured at every age and e-cigarette use was measured at ages 21-23 (0 occasions to 40+ occasions in the past month and past year). Propensity toward using e-cigarettes at age 21 was calculated based on a variety of individual, social, and environmental risk factors common both to e-cigarettes and combustible cigarettes (e.g., gender, smoking attitudes, peers who smoke, state and community of residence, intervention status). **Results:** Analytical sample were never users of tobacco

by age 19 (N = 2297), classified as never having smoked more than 1 cigarette in the past year between ages 10 and 19, and never having reported having smoked 100 cigarettes during one's lifetime. Prior to propensity score adjustment, those who used e-cigarettes reported a 50% greater likelihood of using combustible tobacco at age 23, compared to non-users of e-cigarettes (11% vs. 4%). After adjusting for common risk factors (propensity), e-cigarette users were still 40% more likely to report combustible tobacco use at age 23. **Conclusions:** E-cigarette use among non-users of tobacco poses a serious risk to initiating combustible tobacco products. This was true after accounting for common risk and protective factors.

FUNDING: Federal

PS2-46

GRAPHIC CIGARETTE WARNING POSTERS AND CHANGES IN FUTURE CIGARETTE USE SUSCEPTIBILITY IN ADOLESCENTS: MODERATING AND MEDIATING MECHANISMS

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Significance: Graphic cigarette health warning posters (GWPs) have been proposed as a potential public health strategy for reducing cigarette smoking in both adolescents and adults. Prior experimental work suggests that exposure to GWPs at retail point-of-sale may produce unintended or boomerang effects in some adolescents: GWPs increase future cigarette smoking susceptibility among adolescents who are already at risk for future smoking but not among committed never-smokers. However, little is known about what psychological mechanisms may account for this effect of GWPs on at-risk youths. **Methods:** Participants (N = 441) aged 11-17 years were randomized to experimental "shopping" conditions in a life-sized model convenience store, the RAND StoreLab, in which GWPs were absent ("status quo"; n=107) or visibly displayed near the check-out area (n=334). Participants completed pre- and post-shopping measures of future smoking susceptibility, descriptive and injunctive smoking norms, and perceived harms of smoking. A series of linear regression analyses assessed whether norms and perceived harms differentially mediated the effect of experimental condition on future smoking susceptibility in committed never smokers compared to at-risk youths. **Results:** Tests showed evidence for mediated moderation of the effect of GWP exposure on future smoking susceptibility, such that changes in injunctive norms (i.e., greater perceived social disapproval)—but not descriptive norms or perceived smoking harms—partially accounted for the enhancing effect of GWPs on smoking susceptibility in at-risk youths (average causal mediation effect: B=0.51 [0.14 - 1.22], p = .02). **Conclusion:** For adolescents already at risk of future smoking, GWPs increase perceptions of cigarettes as less socially acceptable, which may in turn increase susceptibility to future smoking in this group. Future work should examine reactance to anti-smoking messaging in retail point-of-sale settings among youth at risk for future smoking.

FUNDING: Federal

PS2-47

PREDICTORS OF SMOKING ASSESSMENT AND CURRENT SMOKING STATUS AMONG ADOLESCENTS IN PRIMARY CARE SETTINGS

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Significance: Primary care visits provide opportunities to identify and treat adolescent tobacco use. Adults seen in safety-net primary care clinics have disproportionately high smoking rates. However, we know little about the rates and predictors of smoking assessment and current smoking among adolescents seen in these settings. **Methods:** Electronic health record data were extracted from patients 10-18 years of age with at least 1 visit to a primary care clinic in the nationwide OCHIN network between 1/1/2016-12/31/2017. Smoking was considered assessed if the discrete field had a value that indicated current, former, or never use. Current smoking was defined as at least 1 recorded status of current smoker during the study period. Patient covariates included sex, age, race/ethnicity, income level, diabetes diagnosis, asthma diagnosis or other respiratory conditions, number of visits, insurance type, and urban/rural primary clinic. GEE logistic regressions modeled odds of smoking assessment and current smoking status by covariates. **Results:** Of the 156,552 adolescents across 15 states meeting study criteria, 87.3% (n=136,627) had at least 1 smoking status assessment during the 2-year period, and of those, 2.1% (n=2,919) reported current smoking. Adjusted odds of assessment were higher among females, older adolescents, Hispanic patients, those



with more visits, and those with a diagnosis of asthma or other respiratory conditions. Compared with privately insured patients, those with public insurance had higher odds (aOR: 1.26, 95% CI: 1.15-1.40) of assessment, while uninsured patients had lower odds (aOR: 0.65; 95% CI: 0.56-0.76). Adjusted odds of current smoking compared to never smoking were higher among males, older adolescents, Non-Hispanic whites, high utilizers, patients without private insurance and with lower income, and those with a diagnosis of asthma or other respiratory conditions. **Conclusions:** Disparities exist in smoking assessment and smoking status among adolescent patients in safety-net settings. Future research is needed to determine the etiology of these differences to ensure all adolescents are assessed and provided cessation assistance, if needed.

FUNDING: Federal

PS2-48

“WHEN I SMOKED IT, IT WAS LIKE A SLAP IN THE FACE BUT IT FELT REALLY GOOD” - USING THE PACE MODEL TO EXPLORE DETERMINANTS OF MIDWAKH USE AMONG YOUNG ADULTS IN LEBANON

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Background: Dokha (‘dizziness’ in English) is a type of Alternative Tobacco Product (ATP) that is increasing in popularity in the Arab world; and smoked out of a pipe called a Midwakh. Midwakh use is most common in the United Arab Emirates (UAE); yet, recent evidence has indicated its expansion to other countries, due in part to the high expatriate population in the UAE (over 80%). Research on Midwakh use is nascent, and no qualitative research has been published. **Objective:** Our study aimed to use an emic approach to explore determinants of Midwakh use among young adults in Lebanon. **Materials and Methods:** We conducted 4 Focus Group Discussions with 18 Midwakh ever smokers aged 18-25 years. Discussions were recorded, transcribed and thematically analyzed using the PACE (Pragmatics, Attraction, Communication, Expectations) model, a framework that provides insight into addiction specificity. **Results:** Thematic analysis confirmed the relevance of the PACE constructs. **Pragmatics** was evident in participant comments about availability of its supply (e.g. “I was in - a coffee shop - and a friend who just came from Abu Dhab - told me you should give it a try and I tried it”). Under the **attraction** theme, participants described why they prefer Midwakh smoking and compared it to other ATPs. They also explained positive effects that served to satisfy their need for the ‘buzz’: “When I smoked it, it was like a slap in the face but it felt really good”. Regarding **communication**, participants shared terms used to describe their use of Midwakh (e.g., ‘buzz’/taking a hit). Participants also described **expectations** from smoking Dokha tobacco (e.g. “I cannot leave the house without smoking a head ... exams are stressful so I need to relax a bit”). The presentation will expand on results related to all the constructs of the model. **Conclusion:** Midwakh tobacco use is appealing to youth due to a variety of factors related to PACE. These results have implications for prevention and control of Midwakh smoking among youth and suggest the importance of applying an ecological model. Further qualitative research is needed to assess generalizability of our results to other contexts.

FUNDING: Academic Institution

PS2-49

VAPING AMONG ADOLESCENTS IN TREATMENT FOR SUBSTANCE USE DISORDERS

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Significance: Little is known about correlates of vaping behaviors among at-risk adolescents. Of particular interest are adolescents who are in treatment for substance use problems, who may be particularly vulnerable to vaping nicotine and cannabis. **Methods:** Data were gathered from all adolescents aged 12-17 with a specialty addiction intake appointment in 3 medical offices of a large, integrated healthcare system (2017-2019; N=283; 65% male, mean age=15.5). We used natural language processing to extract data on patients’ vaping from intake notes. We used multivariable logistic models to test for associations of vaping with socio-demographics, cigarette smoking, and substance use disorders. **Results:** Of the 223 patients screened for vaping (79%), 67% reported ever vaping. A majority reported currently vaping nicotine (52%) or cannabis (53%); 43% vaped nicotine and cannabis; and 38% did not currently vape. Few (4%) were documented current cigarette smokers, yet 20% reported smoking blunts. Com-

mon reasons for vaping nicotine included availability (47%), flavors (28%), ability to use in places one cannot use other forms of tobacco (19%), friends’ use (15%), less dangerous than smoking (15%), and ability to be discreet (7%). Black patients were less likely than other racial/ethnic groups to vape nicotine (OR=.02 to .04, all ps<.01) or cannabis (OR=.09 to .28, all ps<.05), but more likely to smoke blunts (OR=5.8 to 12.1, all p<.02). Those with an alcohol use disorder had higher odds of current vaping of nicotine (OR=3.05, p=.03), and those with “other” substance use disorder (excludes alcohol and cannabis use disorders) had higher odds of current cannabis vaping (OR=3.05, p=.03). Cigarette smoking, age, and sex were not associated with vaping. **Discussion:** Among adolescents in addiction treatment, approximately half reported vaping nicotine and/or cannabis. Black youth had low rates of vaping, but high rates of blunt use. Availability, flavors, social norms, and low risk perceptions were key drivers of use. Research is needed to understand vaping patterns in at-risk adolescents and whether vaping interferes with addiction treatment.

FUNDING: Federal

PS2-50

QUANTIFYING THE INTENSITY OF JUUL USE AMONG PAST 30-DAY USERS

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Significance: While less harmful than cigarettes, electronic cigarettes (e-cigarettes) expose users to toxic chemicals and addictive nicotine. E-cigarettes products vary dramatically, affecting nicotine and toxicant outputs, and posing challenges to quantify use and measure exposure. The high-nicotine e-cigarette JUUL, which comprises three quarters of the market and has standardized pre-filled e-liquid cartridges (pods), presents a unique opportunity to quantify intensity of e-cigarette use. We theorize that use quantity varies by demographics and harm perceptions. **Methods:** Data were collected from a nationally representative sample of U.S. adults aged 18-64, with an oversample of past 12-month JUUL users (n=3415). Past 30-day JUUL users (n=385) quantified the 1) number of days on which they used JUUL, 2) how many pods they used, and 3) how long it took to finish one pod. Pods per day (PPD) was calculated by dividing the number of pods used by the number of days of JUUL use. Harm perceptions compared to cigarettes was measured for e-cigarettes and JUUL separately. Weighted Chi-square analyses assessed JUUL use quantities by demographic characteristics (age, gender, race, smoker status) and relative harm perceptions. **Results:** More than half of past 30-day users used JUUL 1-10 days (60%), and about one quarter used JUUL on 21-30 days (22%). Former and current smokers used JUUL more frequently than never smokers (p<0.01). Half of participants used more than 4 pods in the past 30 days (50%), and a majority finished one JUUL pod in 1-7 days (63%). While 50% of participants used <1/2 PPD, 27% used a 1/2 to <1 PPD, and 23% used one or more PPD. Participants who believed that JUUL was a lot/little more harmful than cigarettes used more pods per day than those who believed JUUL was the same or a lot/little less harmful as cigarettes (p=0.02). **Conclusion:** As a prominent and high-nicotine tobacco product, it is important to capture how users are consuming JUUL to better understand exposure and risk. Interestingly, those with the greatest use rates appear to believe these products are harmful, indicating that nicotine addiction, not harm perceptions, may drive quantity of use.

FUNDING: Other

PS2-51

E-CIGARETTE USE AMONG U.S SECONDARY SCHOOL STUDENTS: SCHOOL-LEVEL PREVALENCE AND CORRELATES FROM A NATIONAL SURVEY

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Significance: E-cigarette use among U.S. adolescents has dramatically increased in recent years. The majority of research has focused on e-cigarette use at the individual-level rather than the school-level. The aim of this study is to examine the school-level prevalence and correlates of e-cigarette use among U.S. secondary school students. **Methods:** School-level data come from the Monitoring the Future survey which is an annual self-administered survey of 38,926 secondary school students in 8th, 10th, and 12th grade attending 580 nationally representative U.S. public and private secondary schools in 2015 and 2016. Self-report measures of past-month e-cigarette use were collected at the student-level and aggregated to the school-level. **Results:** The prevalence of past-month e-cigarette use varied considerably across 580 U.S. secondary



schools, ranging from 0% to 60% at individual schools (Mean = 10.2%, SD = 8.9%). After controlling for relevant individual-level and school-level covariates, multivariable models indicated that e-cigarette use was significantly higher at secondary schools that were located in the Southern and Western regions of the U.S. (vs. Northeastern region), schools with higher proportion of White students, and schools with a higher prevalence of cigarette smoking. For instance, students who attended schools with higher prevalence of past-month cigarette smoking had higher odds of past-month e-cigarette use (High rate of cigarette smoking - AOR = 1.55; 95% CI = 1.23, 1.96, $p < 0.001$; Medium rate of cigarette smoking - AOR = 1.39; 95% CI = 1.16, 1.67, $p < 0.001$). **Conclusion:** This is the first investigation to identify school-level prevalence rates and correlates associated with e-cigarette use among U.S. secondary schools. The wide variation in prevalence of e-cigarette use highlights the need for secondary schools to assess their own student body to guide prevention efforts rather than relying solely on state or national results. School-level demographic, geographical and substance use variables had significant associations with school-level e-cigarette use. Enhanced monitoring and preventive interventions that account for socio-contextual influences are needed. Supported by research grants R01CA203809, R01DA031160 and R01DA044157 from the National Cancer Institute and National Institute on Drug Abuse, National Institutes of Health.

FUNDING: Federal

PS2-52

ASSOCIATION OF METABOLIC RISK PROFILE CHANGE AFTER SMOKING CESSATION AND CARDIOVASCULAR DISEASE RISK IN MIDDLE-AGED MEN. A POPULATION-BASED COHORT STUDY

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Significance The association of change in metabolic risk profile after smoking cessation with cardiovascular disease among recent quitters is unclear. We investigated the effect of change in metabolic risk profile following smoking cessation on cardiovascular risk using a registry-based data. **Methods** We identified 90,765 middle-aged men (age \geq 40 years) from the National Health Insurance Service-Health Screening Cohort (NHIS-HEALS) database who participated in the biennial national health screening from 2009 to 2010 and 2011 to 2012. Patients were followed-up from 2013 to 2015, and were censored at the cardiovascular event, death, or end of follow-up, whichever occurred first. Lifestyle and metabolic risk profile defined from the National Cholesterol Education Program-Adult Treatment Panel III (NECP-ATPIII) criteria for men from health check-up database of the NHIS-HEALS were obtained. The patients were grouped into the following categories: continual smokers, recent quitters (<4 yr) with \geq 2 increased metabolic risk profile, <2 increased metabolic risk profile, no change or decreased metabolic risk profile, sustained ex-smokers (\geq 4 yr), and never smokers. The effect of change in metabolic risk profile after smoking cessation on cardiovascular events was explored with Cox proportional hazards model. **Results** Compared to continual smokers, recent quitters (<4 yr) with \geq 2 increased metabolic risk profile (hazard ratio [HR]=1.04; 95% confidence intervals [CI]: 0.69-1.54) and with <2 increased metabolic risk profile (HR=0.80; 95% CI: 0.58-1.11) were not associated with a decrease in total cardiovascular disease whereas those with no change or decreased metabolic risk profile had a significantly lower risk of total cardiovascular disease (HR=0.79; 95% CI: 0.69-0.99). Sustained ex-smokers (\geq 4 yr) (HR=0.64; 95% CI: 0.57-0.71) and never smokers (HR=0.66; 95% CI: 0.59-0.73) tended to have a significant decrease in total cardiovascular disease risk when compared to continual smokers. **Conclusion** Although it is well-known that smoking cessation is associated with a significant reduction in cardiovascular risk, increased number of metabolic risk profile after smoking cessation appear to attenuate the protective association of smoking cessation on total cardiovascular events. The findings of this study have a clinical implication for the importance of cardio-metabolic risk factor management in smoking cessation intervention in primary care, especially in middle-aged men.

PS2-53

ENDS-RELATED BURN CASES REPORTED TO POISON CONTROL CENTERS IN THE UNITED STATES, 2010 - 2018

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Significance: Despite the increasing popularity of electronic nicotine delivery systems (ENDS) products, health benefits and risks remain unclear. ENDS-related acute adverse effects, such as burn and explosion injuries, have been reported. United States (U.S.) national data indicate that 1,007 battery-related burn injuries occurred in 2016 and 2,035 e-cigarette explosion and burn injuries occurred in 2015-2017. Although these national estimates are valuable information for understanding the burden of ENDS-related burn

and explosion events among individuals who presented to hospital emergency departments (EDs), little is known about individuals who experienced ENDS-related burns but did not present to a health care facility (HCF). **Methods:** This study describes the frequency and characteristics of ENDS-related burn cases in the National Poison Data System (NPDS) in 2010-2018. NPDS contains information collected during telephone calls to poison control centers (PCCs) across the U.S., including ENDS-related burns and other unintended events. **Results:** During 2010-2018, 17,360 ENDS-related exposure cases were documented in NPDS. Of those, 66 were burn cases. The annual number of burn cases increased from one in 2011 to a peak of 26 in 2016, then decreased to 12 in 2018. The majority of the burn cases occurred among young adults aged 18-24 years (28.8%) and adults aged 25 years or older (42.4%). Two (3.0%) cases occurred among children aged younger than five years old. Of burn cases with information on medical outcome (n=54), 37.0% (n=20) were minor (i.e., symptoms were self-limited), 59.3% (n=32) were moderate (i.e., symptoms were more pronounced than minor effect), and 3.7% (n=2) were major (i.e., symptoms were life-threatening). Of burn cases with information on level of care at a HCF (n=55), 5.5% (n=3) were admitted to a critical care unit, and 78.2% (n=43) were treated, evaluated, and released. Of 66 burn cases, 13 (19.7%) were not referred to (n=11) or did not arrive at (n=2) a HCF. **Conclusions:** Approximately one-fifth of ENDS-related burn cases reported to PCCs were not referred to or did not arrive at a HCF. Some burn cases had serious medical outcomes. The burn cases mostly affected young adults and adults. The number of burn cases observed in this study represents a small portion of ENDS-related burn cases, but can serve as a complementary data source to traditional injury surveillance systems.

FUNDING: Federal

PS2-54

TESTING THE EFFECTS OF HOOKAH TOBACCO SOCIAL MEDIA RISK COMMUNICATION MESSAGES IN YOUNG ADULTS

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Significance: Hookah tobacco is commonly used among young adults, and use is driven in part by widespread beliefs that it is not harmful or addictive. Social media use, particularly Instagram, is prominent in this age group, exposure to both commercial and user-generated ads promoting hookah use occurs on Instagram, and there is little to no counter-messaging. To begin to address this gap, this study tested the effects of hookah tobacco risk messaging for delivery via Instagram among young adults. **Methods:** Young adult hookah smokers (18-30 years) were recruited online for a 3x2 between subjects experiment (n=601, M age 26 years, 60% cigarette smokers). Participants completed pre-exposure measures and were randomized to view stimuli displaying risk messages (none, graphic risk, or risk education) interspersed with Instagram hookah ads (commercial or user generated) in the 3x2 design. Stimuli were displayed as an Instagram feed that participants scrolled through at their own pace. Post-exposure outcomes included emotional response, message attitudes, risk appraisals, motivation to quit smoking hookah, and intentions to engage with hookah tobacco ads on Instagram. **Results:** In covariate adjusted analyses, there was a statistically significant main effect of risk message type, but no significant main effect of Instagram ad type or risk message type by ad type interactions. Graphic risk and risk education messages produced greater negative emotional response ($p < .001$) and the graphic messages increased motivation to quit ($p < .05$) compared to Instagram ads alone. Exposure to the graphic risk and risk education messages were associated with lower intentions to engage with hookah tobacco ads on Instagram (odds ratios 0.46 and 0.37, respectively). Hookah use frequency, current cigarette use, and social media use were associated with several outcomes as well. **Conclusion:** This study provides preliminary evidence that hookah tobacco risk messages delivered via Instagram may be capable of offsetting the promoting influence of content promoting hookah tobacco. More testing of hookah tobacco risk messages to be delivered through Instagram and other social media is warranted.

FUNDING: Federal; Academic Institution

PS2-55

EXPLORING THE AMOUNT AND THEMES OF JUUL-RELATED VIDEOS ON YOUTUBE

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Significance: The evidence is clear that the e-cigarette product JUUL exploded in popularity during 2017-2018, capturing a large share of the market and many young users. Youth often share and learn about products like JUUL on YouTube,



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a video-based social media platform, and this content can shape and reinforce norms around JUUL use. The current study characterized amount and content of JUUL-related videos on YouTube to better understand who is speaking about JUUL and what they are saying on a platform visited by many young people. **Methods:** YouTube videos were collected applying the "juul" keyword search rule on the public YouTube API during February, 2019. We retrospectively collected videos published from January, 2016 through December, 2018. Videos were cleaned for relevance, then coded for three classes of channel (news, reviewer, other) and four categories of content (references to: flavors, nicotine, advocacy, and discounts). **Results:** After cleaning, the YouTube public API captured 8,083 JUUL-related videos from 5,135 channels. Total views amounted to over 260 million, with 75% of those views attributed to the top 1% of videos by view count. Product review channels outnumbered news channels 8 to 1 and posted videos mentioning advocacy and discounts much more frequently than other videos. News channels posted videos mentioning flavors and nicotine much more than other videos. Across all videos, flavors and nicotine were the most mentioned content categories. The average like to dislike ratio on JUUL-related videos from news channels was 2:1 but 22:1 for product review videos. The average like to dislike ratio for all other videos (e.g. vloggers, videogame players, meme and compilation channels, comedy channels, etc.) was 8:1. **Conclusion:** YouTube audiences have access to many more videos from product reviewers than news organizations. Videos from product reviewers are much more liked by their viewers and more likely to include vape-industry advocacy and product discounts, which may influence youth perceptions and behavior.

FUNDING: Other

PS2-56

WHAT IS THE IMPACT OF ANNUAL TOBACCO TAX RISES IN REMOTE ABORIGINAL COMMUNITIES IN AUSTRALIA?

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Significance: In Australia, tobacco tax has increased annually by 12.5% since 2013, with further annual increases scheduled to 2020. The national daily smoking prevalence among Aboriginal and Torres Strait Islander people is 39%, 2.8 times that of non-Indigenous people. Between 2002 and 2014/15, daily smoking prevalence among Aboriginal and Torres Strait Islander people fell by only 3% in remote areas, compared with 11% in non-remote areas. Raising tobacco tax is the most effective way a nation can reduce smoking. However, many Australian Indigenous organisations believe tax rises do little to reduce Indigenous smoking, while contributing to economic disadvantage and potentially lowering diet quality. Small Australian and Canadian studies showed negligible impact of tobacco tax rises on smoking in Indigenous populations. In New Zealand, mixed findings showed no clear difference between Māori and non-Māori in their impact. **Methods:** We investigated the impact of annual tobacco tax rises 2016-2018 on fortnightly sales of both tobacco products and fruit and vegetables in 41 stores in remote Aboriginal communities. We used interrupted time series analyses to estimate the impact of tax rises on sales of super value, mainstream and premium factory made cigarettes, loose roll your own (RYO) tobacco (converted to stick equivalents), and fruit and vegetables (kg). **Results:** Total sales of tobacco products (stick equivalents) decreased over the three year period and immediately after annual tax rises (partially offset by increases in sales of RYO tobacco). Sales of fruit and vegetables (kg) increased. **Conclusions:** Our results are much more encouraging than previous research findings and claims about the usefulness of tax rises to reduce Indigenous smoking prevalence. Cigarette sales are falling in remote Aboriginal community stores, and annual tobacco tax rises are associated with reduced cigarette sales without any reduction in fruit and vegetables sales.

FUNDING: Unfunded; Academic Institution

PS2-57

'I CANNOT LIVE WITHOUT MY VAPE' - ELECTRONIC CIGARETTE USER-IDENTIFIED INDICATORS OF DEPENDENCE

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INTRODUCTION: Cigarette smoking dependence is well studied. However, limited research has examined indicators of electronic cigarette (ECIG) dependence. Many measures of ECIG dependence have been adapted from cigarette smoking dependence measures.

This study's purpose was to examine ECIG user-identified indicators of ECIG dependence. **METHODS:** We used concept mapping, a mixed-method participatory approach, to describe user-identified indicators of ECIG dependence. In 2019, adult current ECIG users from 25 states who were recruited from randomly selected Craigslist locations from each of the four U.S. census regions completed an online study. Participants (n = 75; 52.9% women; mean age = 33.2, SD = 9.9) brainstormed statements that completed the prompt: "Something specific that makes me think I am addicted to using my electronic cigarette/vaping device is..." Participants sorted the final list of 93 statements into groups of similar content and rated statements based on how true each statement was for them (1 - Definitely NOT true to 7 - Definitely true). Multidimensional scaling analysis identified ECIG dependence thematic clusters. **RESULTS:** We identified ten clusters of ECIG dependence indicators. From highest to lowest mean rating, the clusters included Craving, Negative Affect, Vaping as a Necessity, Therapeutic Effects, Preparedness, Attachment to Device, Impact on Daily Activity, Physical Withdrawal Symptoms, Monetary Cost, and Shame or Embarrassment. Those who had higher scores on the E-Cigarette Dependence Scale and those who reported more frequent ECIG use had higher mean cluster ratings than those with lower E-Cigarette Dependence Scale scores and who reported less frequent ECIG use. **CONCLUSIONS:** ECIG users who reported being addicted to vaping described many indicators of ECIG dependence. ECIG dependence has similarities to cigarette smoking dependence, but there appear to be characteristics unique to ECIG dependence. These differences may be explained by ECIG product characteristics. Health professionals, researchers, and the public should be aware of the risk of ECIG dependence including indicators that may be unique to ECIG use.

FUNDING: Federal

PS2-58

AFFECTIVE AND COGNITIVE RESPONSES TO GRAPHIC WARNING LABELS AMONG LOW-INCOME SMOKERS, A MIXED METHODS STUDY

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<Significance: Tobacco use disproportionately affects the poorest in the US. The FDA-proposed graphic warning labels (GWLs) on cigarette packs are effective in communicating tobacco-related harms and increasing cessation in the general population. However, few studies have explored the impact of GWLs on cessation among low-income smokers. Our mixed methods study explored how affective and cognitive responses to GWLs motivate cessation among formerly homeless residents living in permanent supportive housing (PSH) in the San Francisco Bay Area. **Methods:** Between October 2017 and February 2018, we recruited 100 PSH residents who smoked from 15 PSH sites to participate in an hour-long counseling intervention on how to adopt a smoke-free home. We presented and discussed GWLs during the intervention, and explored negative/positive affect, perceived efficacy, and appeal/credibility of GWLs pre-intervention and at 3- and 6-months follow-up. After participants completed 6-month follow-up, we recruited a subset of participants (n=20) for semi-structured interviews on perceived efficacy of GWLs on cessation. We used content analysis to analyze transcripts. **Results:** Median age was 58 years and 64% were male. At pre-intervention, 64% agreed that the GWLs would motivate smoking cessation and 89% agreed that they provided useful information. The most common negative affective responses were shock (60%) and disgust (55%), whereas feelings of annoyance (18%) or anger (28%) were less common. These responses did not change at 6-months. During in-depth interviews, participants reported that GWLs that illustrated harmful effects on the body (e.g., damaged lungs) were more appealing than images that generally displayed tobacco-related harms (e.g., cadaver). Some reported that if GWLs were on their cigarette packs, it would remind them of the injurious consequences of tobacco use and the stigma associated with cigarette smoking, thereby motivating cessation. **Conclusions:** GWLs appear to be an important, but underutilized, health communication among low-income smokers. Future studies on the impact of GWLs should examine the effects of negative affect on smoking cessation among this vulnerable population.>

FUNDING: State



PS2-59

ARE ECIGARETTE FLAVORS ASSOCIATED WITH EXPOSURE TO NICOTINE AND TOXICANTS FINDINGS FROM WAVE 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Background: Flavors in e-cigarettes enhance the appeal of these products to users. Data from laboratory studies suggest specific flavorings (e.g., fruit) may increase nicotine delivery compared to other flavors. However, no information exists on whether this extends to population-based data sources, or to other toxicants present in e-cigarettes. Using nationally-representative data, we assessed whether use of specific e-cigarette flavors was associated with urinary biomarkers of exposure to nicotine and select toxicants in regular vapers. **Methods:** Data are from Wave 2 of the PATH Study Biomarker Restricted Use Files. Analyses focused on exclusive e-cigarette users (vapers) who reported using their product within the last 24 hours (n=211). Vapers reported their use of flavored e-cigarettes within the past 30 days, which were classified into use of 1) tobacco-only, 2) fruit-only, 3) single other flavor (including mint, clove, chocolate, and other reported flavors) and 4) fruit + use of additional flavors. Creatinine-adjusted geometric means were calculated for each flavor. Differences between flavors were compared using weighted simple linear regression models. Pairwise comparisons were conducted to assess between-flavor differences; p-values were adjusted for multiple comparisons using a Sidak correction. **Results:** Most vapers reported using only mint, clove, chocolate, and other reported flavors (31%), and fruit and additional flavors (31%), followed by tobacco-only (19%), and fruit-only (19%). Users of fruit-only flavored e-cigarettes exhibited significantly higher concentrations of the biomarker for acrylonitrile (CYMA) compared to users of a single other flavor (geometric mean ratio=2.71, 95%CI: 1.30-5.62, adjusted p-value 0.048). Concentrations of biomarkers of exposure to nicotine (cotinine), benzene (PMA), and acrolein (CEMA) did not significantly differ across flavors. **Conclusions:** Using population-based data, few differences in exposure to nicotine and toxicants were detected. Discrepancies between findings from laboratory studies and observational data describing nicotine and toxicant exposure from flavored e-cigarettes merit future investigation.

FUNDING: Federal

PS2-60

BIOMARKERS OF POTENTIAL HARM AMONG SMOKELESS TOBACCO USERS IN THE PATH STUDY WAVE 1 (2013-2014)-A CROSS-SECTIONAL STUDY

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Background: Smokeless tobacco (ST) use causes oral cancer and is associated with cardiovascular diseases (CVD). Biomarkers of inflammation and oxidative stress processes have been linked to tobacco use and diseases. We assessed differences in certain biomarkers of potential harm (BOPH) in ST and other tobacco users. **Method:** We used Wave 1 biomarker data from 3,370 adults in the Population Assessment of Tobacco and Health Study. We analyzed blood inflammatory biomarkers including Interleukin-6, high-sensitivity C-reactive protein, fibrinogen, and soluble intercellular adhesion molecule-1 (sICAM-1), and a urinary oxidative stress marker F2-isoprostane. We calculated geometric mean concentrations among primary ST users (current exclusive ST use among never smokers; n=56), secondary ST users (current exclusive ST use among former smokers; n=212), exclusive cigarette smokers (n=1,839), dual users of ST and cigarettes (n=113), former exclusive smokers (n=191), and never tobacco users (n=959). We estimated geometric mean ratios (GMRs) and 95% confidence intervals (CIs) by tobacco user group using never tobacco users, exclusive cigarette smokers, and former exclusive smokers as referents, adjusting for age, sex, race/ethnicity, education level, urbanicity, body mass index, CVD risk factors, gum disease, and creatinine for F2-isoprostane; we also adjusted for pack-years for the smoker referent models. **Results:** All BOPH were similar between primary and secondary ST users. Secondary ST users had higher sICAM-1 (GMR=1.06, 95%CI: 1.00-1.14) compared to never tobacco users. Compared to current smokers, most BOPH were lower among secondary ST users, and primary ST users had significantly lower levels of sICAM-1 (GMR=0.83, 95%CI: 0.74-0.92) and F2-isoprostane (GMR=0.79, 95%CI: 0.67-0.94). Secondary ST users had higher sICAM-1 (GMR=1.03, 95%CI: 0.92-1.16) compared to former smokers, after adjusting for demographic, health risk, and smoking factors. **Conclusions:** ST users have lower levels of inflammatory and oxidative stress biomarkers than cigarette smokers; however, secondary ST users have higher sICAM-1 levels compared to never tobacco users and former exclusive smokers.

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FUNDING: Federal

PS2-61

COMPARING REASONS FOR INITIATING PREVALENT ENDS PRODUCTS AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF U.S. ADULTS

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Significance: Use of electronic nicotine delivery systems (ENDS) has been increasing in the U.S. and studies have found varying reasons for initiating these products, including smoking cessation as well as recreational reasons such as "social use." JUUL, an ENDS product occupying 74% of the market, is branded as a device to help adult smokers "switch" from combustible cigarettes. However, no research to date has examined the reasons for JUUL initiation, or whether these differ from other ENDS products. This analysis aims to identify and compare the reasons for product initiation among the 5 most frequently used ENDS products by U.S. adults, including JUUL. **Methods:** Data were collected from October-December 2018 among a probability-based panel of adults ages 18-64. Those with past 12-month JUUL use were oversampled (n=480), resulting in a total sample of n=3,415. Data were weighted to be nationally representative. The five most frequently used ENDS products were identified based on past 12-month use. A non-exclusive question prompted participants to choose the reasons why they initiated each ENDS product for which they reported past 12-month use. Chi-squared tests evaluated significant differences in reasons for ENDS initiation. **Results:** The most frequently used ENDS included JUUL, Blu, Smok, VUSE and Kanger. Among JUUL users, the most frequently selected reason for initiation was that a "friend used them" (71%). JUUL users selected "to quit" (23%) as the fourth most frequent reason for initiation. By comparison, users of the other four ENDS products selected "to quit" as the first or second most frequent reason for initiation (31%-42%); significantly more than JUUL (p<0.05). Compared to the other top four ENDS products, JUUL users initiated use significantly more frequently because a "friend used them" (p<0.001), "they are available in flavors" (p<0.05), and "to get a buzz" (p<0.05). **Conclusion:** Results suggest that JUUL initiation is driven more by recreational reasons than cessation when compared to other popular ENDS products. More research is needed on ENDS, and JUUL in particular, to understand what is driving differential reasons for initiation across products.

FUNDING: Other

PS2-63

TOBACCO USE IN A BINATIONAL SAMPLE OF LATINO COMMUNITY HEALTH CENTER (CHC) PATIENTS

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SIGNIFICANCE: Tobacco use is a large contributor to preventable death both in the US and Mexico. We examined rates and correlates of tobacco use among a binational sample of Latino primary care patients in CHCs near the US-Mexico border (East Los Angeles and Tijuana). **METHODS:** In 2013, 6660 adult patients in 8 clinic waiting rooms anonymously self-administered a computerized version of the WHO ASSIST. **RESULTS:** Mean age 41.8 years; 97% Latino, 27% male; 65% Mexico clinics; 35% US clinics. US had higher rates of tobacco use than Mexico in lifetime (52% vs 47%), past 3 months (21% vs 14%), weekly to daily use (10% vs 8%) (p<.001). Tobacco users were more likely to have concurrent use of every other substance (alcohol and all drug types). Among the 589 (9%) current frequent tobacco users (weekly-to-daily in the past 3 months), 74% used near-daily or daily, 60% did not see their tobacco use as problematic, 44% a friend or relative recently expressed concern about their use, 55% had tried and failed to reduce tobacco use. Odds were higher for weekly-to-daily tobacco use for males (AOR = 3.19, CI 2.67-3.80); aged 35-45 and 46-60 vs 18-25 year-olds (AOR = 1.60, CI 1.20 - 2.12 and AOR 1.70, CI 1.29 - 2.23, respectively); and Mexico born had lower odds than US born (AOR = 0.70, CI 0.55 - 0.91). **CONCLUSIONS:** One-fifth of US Latino CHC patients have current tobacco use (past 3 months), similar to the general population (NSDUH, past month); most had concurrent use of other substances. Our findings suggest benefit of tobacco screening and coun-



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selling in US and Mexico CHCs. A positive screening should prompt screening for other substance use. The majority have contemplated or attempted quitting, identifying an opportunity for primary care and community interventions to decrease Latinos' tobacco use.

FUNDING: Federal; Nonprofit grant funding entity

PS2-64

MECHANISMS LINKING PAIN AND SMOKING DURING A QUIT ATTEMPT

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Evidence suggests that pain is associated with smoking, but few studies have identified mechanisms that link pain with smoking. This study examined whether depressed mood, perceived stress, and smoking expectancies mediated the association between pain and smoking among adults enrolled in a three-armed clinical trial that compared in-person and smartphone-based smoking cessation interventions. Pain was measured at baseline. Perceived stress, smoking expectancies, and depressed mood were measured once daily, via a smartphone app, throughout the 1st week of the quit attempt; these variables were aggregated for analyses. Biochemically confirmed (CO <7 ppm) 7-day point-prevalence smoking abstinence was measured 4 weeks post-quit date. Participants ($N=81$) were mostly White (63%) and on average, 49 years of age. At baseline, participants reported moderate nicotine dependence on the Heaviness of Smoking Index ($M=1.2$, $SD=0.5$), and 54% of participants reported experiencing *moderate* or *severe* pain. Sequential mediation analyses showed that participants who reported *moderate* or *severe* pain, compared to *none* or *mild* pain, felt more stressed ($B=0.54$, $SE=0.19$, $p<0.01$) and depressed ($B=0.76$, $SE=0.20$, $p<0.01$). Higher stress ($B=0.42$, $SE=0.12$, $p<0.01$) and depression ($B=0.26$, $SE=0.12$, $p=0.03$) were associated with greater belief that smoking would improve mood (e.g., smoking expectancy), which was, in turn, associated with higher odds of smoking four weeks after the quit attempt ($OR=2.49$ [95% CI=1.13, 5.50]). Path analyses indicated that pain indirectly increased the odds of smoking through the stress/smoking expectancy pathway by 20% ($OR=1.20$ [95% CI=1.00, 2.27]) and the depression/smoking expectancy pathway by 20% ($OR=1.20$ [95% CI=1.00, 1.85]). Findings suggest that pain may induce stress and depression, and people who feel depressed or stressed may believe that smoking would improve their mood, which subsequently may increase their risk of smoking lapse. Interventions that treat people with moderate or severe pain may need to provide psychoeducation that teaches adaptive coping responses, such as physical activity, for stress and depression.

FUNDING: Federal; State; Academic Institution

PS2-65

EXAMINING THE ROLE OF CIGARETTE SMOKING AND CESSATION ON COMBINED RISK OF INCIDENT DEMENTIA, NURSING HOME PLACEMENT, AND DEATH IN COGNITIVELY HEALTHY AND MILD COGNITIVELY IMPAIRED ADULTS

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Background: Cigarette smoking directly and indirectly accounts for a 70% increased risk of dementia onset with smoking cessation lowering this risk. However, this risk may be underestimated due to challenges disentangling key outcomes (i.e. death or nursing home placement prior to dementia diagnosis). Further, the magnitude of these risks remains unexplored in smokers with mild cognitive impairment (MCI). We sought to examine the impact of smoking status, duration of smoke exposure, and duration of abstinence on key outcomes of diagnosis of dementia, nursing home placement, or death (Dem/NH/Death). **Methods:** We conducted three Cox-regression proportional hazard analyses to model conversion to event (Dem/NH/Death) using the NACC dataset, stratified by baseline cognitive status (cognitively healthy [CH; $N=10852$; $M_{age}=72.0$; 64.6% Female; 81.4% Caucasian] vs. MCI [$N=4931$; $M_{age}=73.4$; 49.1% Female; 81.5% Caucasian]). Time delayed entry methods accounted for varying age of entry. **Model 1:** smoking status (former vs. current smoker). **Model 2:** pack years (PY) comparing

never (0 PY) smokers to low (>0 - <20 PY), moderate (20 - <40 PY), and heavy (≥ 40 PY) users. **Model 3:** duration of abstinence (i.e., not quit, >0->10 years, 10->20 years, 20->30 years, ≥ 30 years) compared to never smokers. **Results:** (1) CH current smokers had higher rate of conversion ($HR=2.18$; 95% CI 1.74-2.75; $p<0.001$). (2) CH heavy use smokers had higher rate of conversion ($HR=1.36$; 95% CI 1.16-1.59; $p<0.001$). (3) CH current smokers had increased rate of conversion than never smokers ($HR=2.14$; 95% CI 1.71-2.67; $p<0.001$). After 10 years of quitting, former smokers did not differ from never smokers in rates of Dem/NH/Death ($HR=1.65$; 95% CI 1.25-2.18; $p<0.001$). None of the results from the MCI group were significant ($p>.05$). **Conclusions:** Using a more comprehensive outcome suggests an even greater negative impact of smoking on dementia and highlights the benefit of quitting on these risks. The lack of significant findings in the MCI group may be related to diagnostic confounders (e.g., race, socioeconomic status). Future research is needed among this group of smokers.

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PS2-66

E-CIGARETTE USE DEFINITIONS AND YOUTH: DEVELOPING CLASSIFICATIONS FOR DIFFERENTIATION BETWEEN "EXPERIMENTER" AND "ESTABLISHED USERS"

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Significance: Previous measures of e-cigarette experimentation include lifetime use, recency of use, and rate of use; however, a consensus has yet to be made on the response cutoffs for these measures to define "experimenters" or "established users" (e.g., using an e-cigarette in the past 30 days vs. using 100 or more e-cigarettes lifetime). The goal of the current study was to gather data that would be useful in developing classifications for e-cigarette "experimenters" and "established users" for youth ages 12-17 years. **Methods:** The current study used Wave 1 youth data (September 2013-December 2014) from the Population Assessment of Tobacco and Health (PATH) study. We used lifetime e-cigarette use and recency of e-cigarette use measures to create twelve different ways to define "experimenters" (e.g., 1-10 times ever using an e-cigarette) and "established users" (e.g. 10+ times ever using an e-cigarette). Each of the "experimenter" and "established user" definitions were compared on selected knowledge attitude and belief measures using multivariate T-squared tests, and Caliński-Harabasz pseudo-F index scores to determine which definitions resulted in greatest discrimination between groups. **Results:** Statistically significant differences in attitudes/beliefs emerged between e-cigarette "experimenters" and "established users" when measures of "more than 100 lifetime uses" and "past 30-day use" were included in the definitions. The combination of lifetime use and recency of use provided nuanced detection between "experimenters" and "established users". Including past 30-day use measure with a frequency of use measure provided more discrimination in defining ENDS experimenters. **Conclusions:** Practitioners could use both lifetime use and recency of use measures when attempting to categorize youth respondents as experimenters or established users of ENDS.

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PS2-67

BEHAVIORAL HEALTH CONDITIONS AMONG US ADULTS WHO SMOKE CIGARETTES BY SEXUAL ORIENTATION- RESULTS FROM THE NATIONAL SURVEY ON DRUG USE AND HEALTH

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Significance: There is extensive evidence that sexual minority populations have higher prevalence of cigarette smoking than heterosexuals. This disparity may be influenced by elevated rates of behavioral health (BH) conditions in these populations, which are also associated with a high prevalence of cigarette smoking. The aim of this study was to assess the prevalence of BH conditions among adults who smoke cigarettes by sexual orientation in a nationally-representative U.S. sample. **Methods:** Using the 2015-2017 National Surveys on Drug Use and Health, we analyzed data from 30,471 adults (≥ 18 years) who currently smoke cigarettes, using descriptive and bivariate analyses to assess the weighted prevalence of BH conditions by sexual orientation (heterosexual, gay/lesbian, bisexual, don't know); respondents who refused to answer this question were excluded. Specifically, we examined the prevalence of any mental illness (AMI), substance use disorder (SUD), and co-occurring AMI and SUD. **Results:** Heterosexual adults who smoke had the lowest prevalence of any BH condition (35.1% vs. 46.6%-63.6% in non-heterosexual; $p<0.001$), while bisexual adults had the highest prevalence



across all sexual orientation groups (63.6%; $p < 0.001$), varying by condition: 33.3% for AMI, 7.9% for SUD, and 22.4% for co-occurring AMI/SUD ($p < 0.001$). Gay/lesbian adults who smoke also had an elevated prevalence of AMI (24.7%) compared to heterosexuals (17.7%; $p < 0.001$), and gay/lesbian women who smoke had higher prevalence of AMI than other female sexual orientation groups (27.1%; $p < 0.001$). Adults who smoke that identified with a "don't know" orientation reported a higher prevalence of SUD (22.1%) than other orientation groups (7.9%-11.1%; $p < 0.001$); this was elevated in men identifying with "don't know" (25.8%) compared to other male sexual orientation groups ($p < 0.001$). **Conclusions:** Among adults who smoke, sexual minorities have a higher prevalence of BH conditions than heterosexuals. It is important for tailored cessation resources to consider the unique needs of sexual minority communities, as well as the complexities of tobacco use and cessation in sexual minority individuals with BH conditions.

PS2-68

INFLUENCE OF CIGARETTE SMOKING ON SCHOOL ABSENTEEISM AND OVERALL HEALTH STATUS AMONG U.S. ADOLESCENTS

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Significance: Cigarette smoking is a leading cause of preventable morbidity among adolescents. The study objective was to examine the relationship between adolescent cigarette smoking and overall health status and health-related school absenteeism. **Methods:** Data were obtained from the 2017 National Survey on Drug Use and Health and included 11,884 adolescents aged 12-17 years without an asthma diagnosis. Outcome variables included adolescents' overall health status and whole school days missed due to being sick in the past 30 days. Cigarette smoking variables included ever (>30 days) and current smoking (≤ 30 days). We performed multivariable logistic regression analyses to assess the associations between ever smoking and overall health status and health-related school absenteeism, adjusting for adolescent age, sex, race/ethnicity, and income level. We built similar logistic regression models to examine the relationships between current smoking behavior and the health-related indicators while controlling for sociodemographic covariates. **Results:** A total of 8.3% adolescents reported ever cigarette smoking and 3.8% reported current cigarette smoking. Of current adolescent smokers, 30.1% were nicotine dependent. Ever smokers were at increased odds of reporting good/fair/poor health status (adjusted odds ratio [aOR]=1.48, 95% confidence interval [CI]=1.28-1.71, $p < 0.001$) and missing school due to being sick on at least one day in the past 30 days (aOR=1.43, 95%CI=1.21-1.69, $p < 0.001$) than never smokers. Current smokers were 2.40 times more likely (95%CI=1.96-2.93, $p < 0.001$) to report good/fair/poor health status than those who did not report current use. Current smokers were also 2.11 times more likely (95%CI=1.62-2.76, $p < 0.001$) to have missed school due to being sick. **Conclusion:** Cigarette smoking is associated with lower overall health status and missing school due to illness. Smoking prevention and cessation programs should educate adolescents and their families about smoking-related health consequences. Implementing prevention efforts is critical for reducing health-related school absenteeism.

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PS2-69

EXAMINING FACTORS IN MULTIPLE HEALTH BEHAVIOUR CHANGE INTERVENTIONS THAT ARE ASSOCIATED WITH SUCCESSFUL OUTCOMES

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Significance: Multiple health risk behaviors have a synergistic negative influence on health resulting in increased rates of morbidity and premature mortality. Although there have been hundreds of interventions that address multiple health behaviors, much remains unknown about how to successfully optimize these interventions. The aim of this rapid realist review was to identify possible mechanisms used in multiple health behaviour change interventions (targeting tobacco and two or more additional risk behaviours) that are associated with effectively changing tobacco use. **Methods:** This realist review method incorporated the following steps: (1) clarifying the scope, (2) searching for relevant evidence, (3) relevance confirmation, data extraction, and quality assessment, (4) data analysis and synthesis. **Results:** Of the 20,423 articles screened, 138 articles were included in this realist review. Following Michie et al.'s

behavior change model (the COM-B model), capability, opportunity, and motivation were used to identify the mechanisms of behaviour change. Universally, increasing opportunities (i.e. factors that lie outside the individual that prompt the behaviour or make it possible) for participants to engage in healthy behaviours was associated with smoking cessation success. However, increasing participant's capability or motivation to make a behaviour change was only successful within certain contexts. **Conclusion:** In order to address multiple health behaviours and assist individuals in quitting smoking, public health promotion interventions need to shift away from 'individualistic epidemiology' and invest resources into modifying factors that exist outside of the individual (i.e. creating a supportive environment).

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PS2-70

NOT ALL NORM INFORMATION IS THE SAME: EFFECTS OF MEDIA EXPOSURE ON YOUNG PEOPLE'S PERCEPTIONS OF E-CIGARETTE AND TOBACCO USE NORMS

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Significance: Young people's norm perceptions about the use of e-cigarettes (ecig) and other tobacco products (tobacco) may be impacted by descriptive norm information in media, including information about use by individuals (individual use) or populations (population norms). We measured the prevalence of norm information in a large corpus of tobacco and ecig media content over time. We then tested whether the amount of norm coverage in a given week predicted self-reported descriptive and injunctive norm perceptions in a rolling cross-sectional survey of more than 11,000 13-25-year-olds. **Methods:** Using automated content analysis, we measured the prevalence of norm mentions in Tweets ($n=75,322,911$), texts from 4 long-form mass media sources ($n=135,764$), and views of YouTube videos ($n=12,262$) over a 3-year period. We fit ordinal logistic regression models to test the effects of past 7-day norm coverage from each source on descriptive (peer use) and injunctive (peer approval of respondent use) norm perceptions. Wald tests with bootstrapped standard errors assessed the joint significance of predictors. **Results:** Long-form and YouTube (not Twitter) tobacco individual use coverage significantly predicted descriptive norm perceptions, but long-form predicted higher estimates of others' use while YouTube predicted lower estimates. Long-form tobacco individual use coverage also had a positive relationship with injunctive norm perceptions while Twitter coverage had a negative relationship; YouTube had no relationship. For ecig, only YouTube individual use coverage showed a relationship with any norm perceptions (negative association with injunctive). Population norm coverage had no relationship with tobacco or ecig norm perceptions. **Conclusions:** These results demonstrate that exogenously measured ecig and tobacco norm information in the media can predict young people's norm perceptions. However, the effects differ by media source, norm category, product and type of norm perception. Uncovering these differences helps us understand which ecig- and tobacco-related norm information in media impacts young people and how. It also points to future research questions about the complex and dynamic interplay of mediated norm information and norm perceptions.

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PS2-71

WHERE DOES WATERPIPE TOBACCO COME FROM? RESULTS OF FDA'S HOOKAH PURCHASE JOURNEY

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Background: Effective August 2016 per the Deeming Rule, FDA's Center for Tobacco Products (CTP) regulates waterpipes and waterpipe tobacco. In October 2017, CTP began the "Hookah Purchase Journey" project to better understand the marketplace for waterpipe tobacco (WPT). One objective is to understand the WPT supply chain from "field to U.S. consumers." **Methods:** Analytical methods included secondary research of public domain websites, including U.S. import data and UN Comtrade data, review of SEC filings, court filings, and patents. Results were confirmed through primary qualitative and quantitative research methods. **Results:** Flue cured, Virginia tobacco, of the *Nicotiana tabacum* species, is the most common leaf used in WPT. These tobacco leaves are grown predominantly in China, Brazil, and India. Russia, Belgium, Germany, and the US are the leading importers of raw tobacco leaves for all tobacco products, including WP. The raw, cut WPT is further processed into the semi-finished form with the addition of molasses, honey, glycerin, and/or preservatives primarily in the U.A.E.,



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Jordan, and Egypt before it is imported into the U.S. Final WPT processing occurs with the addition of propylene glycol, glycerin, antifungal agents, antimicrobial agents and flavoring agents in the U.S. The U.S. has imported over 2,000 tons per year (~1% of U.S. raw tobacco import) of WPT since 2015. In 2017, the WPT company, Al Fakher, imported over two-thirds of the WPT into the U.S. **Conclusions:** WPT manufacturing processes occur in several countries before U.S. import and sale. Understanding the WPT supply chain from farm to consumer augments CTP's ability to effectively regulate these products at the manufacturing and consumer levels.

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PS2-72

SUSCEPTIBILITY TOWARDS ALTERNATIVE TOBACCO PRODUCT USE AMONG ADOLESCENTS NOT SUSCEPTIBLE TO USE CIGARETTE

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Background: Alternative (non-cigarette) tobacco products are gaining popularity among adolescents in the United States (US). We investigated the susceptibility of alternative tobacco product use among adolescents who were not susceptible to use conventional cigarette in the future. **Methods:** Data were drawn from the 3rd wave of the nationally-representative Population Assessment of Tobacco and Health (PATH) survey among US adolescents who were not susceptible to use conventional cigarettes (12-17-year-olds; n = 6,549). We performed weighted logistic regression analyses to estimate the adjusted odds ratios (aORs) of being susceptible to use alternative tobacco products vs not being susceptible (the reference group). **Results:** Susceptibility was highest for e-cigarettes (9.1%) followed by hookah (7.2%), traditional cigars (4.2%), cigarillo (2.7%), filtered cigars (2.2%), smokeless tobacco (1.8%), and snus (1.3%). While there were no gender differences in susceptibility to e-cigarettes, males were less susceptible to use hookah (aOR=0.76). Relative to non-Hispanics, Hispanics were more susceptible to use hookah (aOR = 1.23), e-cigarette (aOR=1.13), and cigarillo (aOR=1.02) and less susceptible to use snus (aOR=0.91), traditional cigars (aOR=0.78), and filtered cigars (aOR=0.71). Compared to other races, African American adolescents were more susceptible to use cigarillo (aOR=2.5), hookah (aOR=1.43), e-cigarette (aOR=1.05), traditional cigars (aOR=1.15), and filtered cigarette (aOR=1.02), whereas White adolescents were less susceptible to use e-cigarette (aOR=0.80), traditional cigars (aOR=0.93), cigarillo (aOR=0.77), and hookah (aOR=0.68). African Americans and Whites were less susceptible to future use for smokeless tobacco and snus compared to other races. Adolescents aged 12-14-year-olds were less susceptible to all alternative tobacco products compared to 15-17-year-olds. **Conclusions:** Our findings revealed that adolescents who are not susceptible to use cigarette are susceptible to use alternative tobacco products, particularly e-cigarettes and hookah. Targeted prevention programs are required to curb the risk of initiation of alternative tobacco products among nicotine-naïve adolescents who otherwise would not become dependent on nicotine.

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PS2-73

FOOD INSECURITY AND CIGARETTE SMOKING IN SEXUAL MINORITY WOMEN AND MEN

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Background: Sexual minority women and men (self-identify as lesbian, gay, or bisexual or engage in same-sex behavior; SMW/SMM) are 1.5-3.5 times more likely to currently smoke than heterosexuals. Identifying novel, modifiable determinants of smoking is critical for eliminating persistent smoking disparities in these groups. In the general population, food insecurity is independently associated with cigarette smoking, however, no evidence describes how food insecurity may give rise to smoking in SMW/SMM. We investigated associations between food insecurity and smoking behaviors in SMW/SMM where sexual orientation was defined by sexual identity and behavior. **Methods:** We pooled 2005-2014 National Health and Nutrition Examination Survey data to investigate food insecurity as a determinant of current cigarette smoking, nicotine dependence, and cigarette smoking intensity in SMW/SMM defined by sexual identity and behavior (lifetime and 12-month). Multivariable regression analyses were weighted for complex survey design. **Results:** Adjusted, gender-stratified analyses indicated that food insecure (vs. food secure) SMW were more likely to report current smoking when sexual orientation was defined by sexual identity and lifetime sexual behavior (food insecure: aOR = 1.70;

95% CI, 1.11-2.59). When sexual orientation was defined by sexual identity and behavior, food insecure SMW reported smoking 33-82% more cigarettes daily on average than food secure SMW (lifetime: aOR = 1.33; 95% CI, 1.07-1.66; 12-month: aOR = 1.82; 95% CI, 1.20-2.74). **Conclusion:** Our findings suggests that food insecurity may be an important modifiable determinant to current smoking and increased smoking intensity in SMW defined by sexual identity and behavior. Future research must consider how food insecurity gives rise to smoking in this population to develop tailored and targeted cessation interventions that engage food insecure SMW in successful quitting.

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PS2-74

ADOLESCENT PERCEPTIONS OF JUUL AND OTHER POD-STYLE E-CIGARETTES - A QUALITATIVE STUDY

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Background E-cigarettes are the most common form of tobacco used among teens. Most popular among teens are the latest generation of nicotine-salt based pod-vaporizers (i.e. JUUL). We examined individual, social, and environmental factors that contribute to teen use of pod-vaporizers. **Methods** Six focus groups were conducted in June 2019 with middle and high school students. Groups were stratified by use (ever vs non-use) and age (middle school; freshmen/sophomores (F/S); junior/seniors (J/S)). **Results** 29 students participated, including 16 non-users; 3 users; 5 middle schoolers; 12 F/S; and 12 J/S. Most (58.6%) were female; 65.5% White, and 27.6% Hispanic. JUUL was the most common pod used, followed by Vuse Alto. Preliminary analysis of the qualitative data indicate that most students, no matter their age or use status, knew JUUL has nicotine but did not consider JUUL a tobacco product. Users and non-users reported students use "all the time" at school; most said they knew a teen addicted to JUUL. Non-users reported changing their routines at school to avoid second-hand vape. Non-users highlighted product characteristics that keep them from vaping including cost, unappealing smell, potential for addiction and unknown harms. Social and environmental factors that inhibit their use included non-using peers and fear of parent/school consequences. Factors associated with use among users included product discreetness and ability to ease stress. Users had reduced relative risk perceptions of JUUL compared to cigarettes; perceived low risk of getting caught at school or home; and easy access from peers at school and parties. Some users reported not owning a JUUL but "taking hits" from peers' devices; others reported having multiple JUULs. Participants reported hearing messages about JUUL's risk and benefits on social media, television and radio. Some participants felt school officials could do more to identify users and confiscate products at school. Few said a physician or teacher had discussed vaping with them, and most stated there were limited resources for teens trying to quit. High school students suggested peer groups/counseling as a mechanism to help students. **Conclusions** Findings highlight school-level factors to address increasing e-cigarette use, including training school officials to identify products and establishing peer-led groups to help students. Other strategies include encouraging physicians to discuss vaping with teen patients and communication campaigns targeting teens to increase knowledge and potential harms of vaping.

FUNDING: Academic Institution

PS2-75

'TAKING UP A NEW PROBLEM' - A QUALITATIVE STUDY OF THE CONTEXT AND DETERMINANTS OF POD-MOD E-CIGARETTE USE AMONG UNIVERSITY STUDENTS

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SIGNIFICANCE: Since e-cigarettes (ECIGs) entered the US market, their use has increased dramatically, especially among young adults. ECIG use increases risk of cigarette smoking initiation among young adults, so there is a need to understand the context of ECIG use initiation and continued use. The college environment may play a role in ECIG use. This study used qualitative research methods to conduct an in-depth exploration of the context and determinants of ECIG use among university students in the US. **METHODS:** We conducted interviews with 53 students (mean age = 19 years, 57% female, 62% White) on three campuses in the Southeast, Midwest, and Northwest. Participants were recruited by advertisements via email, social media, and flyers. Participants were required to have used ECIGs on at least two days/week of the



past month. We used a structured interview guide to ask about ECIG use initiation, how ECIG use fit in with college life, and perceptions of vaping addiction. Interviews were audio-recorded and transcribed verbatim for analysis. A codebook was used for thematic analysis. RESULTS: Emergent themes described the process of uptake and current use patterns of ECIGs. Themes included 'cognitive dissonance' - negative emotion due to conflict between ECIG use and recognition of the potential risks or negative stigma of vaping. 'Self regulation' involved participants taking actions to reduce or eliminate their own e-cigarette use behavior such as making a contract with friends. The theme 'growing out of vaping' suggested participants only saw their vaping as part of college culture. Participants also saw ECIG use among young adults as mimicking the history of cigarette uptake, and described the social cues in the college environment that promote ECIG use. CONCLUSION: Our results demonstrate that the college environment plays a major role in young adult ECIG initiation and progression to more frequent use. A range of determinants at multiple ecological levels combine to provide a conducive environment to fuel the vaping epidemic. These findings can inform the development of tailored interventions to prevent and control uptake of ECIGs by young adults.

FUNDING: Academic Institution

PS2-76

THE EFFECTS OF A COMPARATIVE HEALTH MESSAGE VS THE EU NICOTINE ADDICTION HEALTH WARNING ON PERCEPTIONS OF HARM AND INTENTIONS TO USE E-CIGARETTES

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Significance: The aims were to investigate the effects of the European Union Tobacco Products Directive [EU-TPD] Article 20 E-cigarette (EC) health warnings ("This product contains nicotine which is a highly addictive substance. [It is not recommended for non-smokers.]") and a comparative harm message ("Use of this product is much less harmful than smoking" [COMP]) on smokers' and non-smokers' perceptions and behavioural intentions. **Methods:** 2495 UK residents (1283 smokers and 1212 non-smokers) self-reported perceived harm, addictiveness, EC effectiveness, social acceptability, and intentions to purchase and use EC, and in smokers, intentions to quit and intentions to use EC in future quit attempts. These were measured before and after exposure to EC images containing either the TPD, COMP, TPD+COMP or no message. **Results:** Non-smokers had higher harm, addictiveness and lower social acceptability perceptions compared to smokers. TPD presence increased, whilst COMP decreased, harm and addictiveness perceptions in both groups. There were no effects on social acceptability, EC effectiveness or intentions to use. In smokers only, intentions to purchase an EC were higher following exposure to the COMP alone vs. TPD alone. TPD presence also significantly reduced smokers' quit intentions compared to COMP alone. **Conclusion:** Current EU nicotine warnings may have the unintended consequence of increasing smokers' harm and addictiveness perceptions related to EC, deter purchase intentions and decrease quit intentions. These effects can possibly be reversed with a comparative message which de-emphasises EC harms in the context of smoking. These results can further our understanding of how to communicate EC relative health risk information.

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PS2-77

TYPOLOGIES OF TOBACCO AND OTHER SUBSTANCE USE AMONG YOUTH AND YOUNG ADULT E-CIGARETTE USERS

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Rates of e-cigarette use among young people have dramatically increased in recent years. This has raised concern over the potential associations with future combustible use, as well as the potential for nicotine addiction among young users. Research also suggests e-cigarette users are more likely than nonusers to use other substances, however little is known about the patterns of poly-use among young e-cigarette users. This study used latent class analysis (LCA) to identify classes of tobacco/other substance use among a sample of youth and young adults who are current e-cigarette users. Data come from a national, longitudinal cohort study (ages 15-21 at baseline). Participants were recruited via ABS, with subsamples recruited from existing online panels. Data were collected online Feb-May 2019 (N=10,702). Participants reported the number of days in the past 30 days they used each of the following substances: 1) e-cigarettes, 2) cigarettes, 3) cigars, 4) hookah, 5) smokeless tobacco, 6) marijuana, and 7) 5+ alcoholic beverage on an occasion. Current use of all substances was defined as use on 1+ day in the past 30 (yes/no). The analytic sample was restricted to those who reported current e-cigarette use (n=1,771, 16.5% of total sample). LCA identified distinct classes

of polysubstance use based on participants' current use of each substance. A 3-class model was the best fitting LCA model. Class 1 included those who are current alcohol and marijuana users, and not current users of any other tobacco products (n=696, 39.3%). Class 2 included those who are current users of cigarettes, cigars, alcohol, marijuana, and to a lesser extent, smokeless tobacco and hookah (n=224, 12.6%). Class 3 included those who use alcohol, with some cigarette use (n=851, 48.1%). Initial results suggest that distinct classes of polysubstance use emerged among youth and young adults who are current e-cigarette users. These results can help inform targeting of tobacco and other substance use prevention efforts to those most at risk. Next steps include a multinomial logistic regression model to understand associations between demographic and psychosocial characteristics and class membership.

FUNDING: Other

PS2-78

ASSESSING QUALITY-ADJUSTED YEARS OF LIFE LOST ASSOCIATED WITH CIGARETTE SMOKING AND SMOKELESS TOBACCO USE

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Significance: Tobacco use is the leading cause of preventable disease and death in the U.S. Cigarettes and smokeless were the most popular tobacco products sold in the U.S. based on dollar sales in 2018. **OBJECTIVE:** To quantify quality adjusted life years (QALYs) lost associated with lifetime exclusive cigarette and smokeless tobacco use among U.S. adults by sex and age groups. **METHODS:** The 1987, 1991, 1992, 1994, 1998, 2000, 2005, 2010, and 2012 through 2014 adult data of National Health Interview Survey (NHIS) linked with death certificates records from the National Death Index (NDI) were used to define current exclusive cigarette and smokeless tobacco use, and to assess mortality risk associated with lifetime exclusive use. Methods from the 1995 CDC NCHS *Years of Healthy Life* report were used to assess health-related quality of life (HRQoL) for adults in the 2000, 2005, 2010, and 2012 through 2017 NHIS. HRQoL and mortality risk associated with lifetime exclusive use were estimated by regression and Cox proportional hazard modeling, respectively, adjusting for age, sex, race/ethnicity, body mass index, education, and household poverty level. QALYs were estimated based on adjusted HRQoL and mortality risks. **RESULTS:** Current exclusive cigarette smokers aged 25 to 29 live 8.05 (SE = 0.09) less years of healthy life compared to never tobacco users, if they continue to smoke cigarettes for the rest of their lives. Current exclusive smokeless tobacco use is associated with 4.10 (SE = 0.22) years of healthy life loss for males aged 25 to 34 compared to never tobacco users, if they continue to use smokeless tobacco product for the rest of their lives. QALYs loss for female smokeless tobacco users could not be determined due to small sample sizes. **CONCLUSION:** Either current exclusive cigarette or smokeless tobacco use is associated with reductions in QALYs. Reductions in QALYs can be lessened through preventing the uptake of tobacco product use or helping tobacco product users quit as early in life as possible. The use of these tobacco products represents an important public health issue that significantly affects the health and well-being of millions of Americans.

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PS2-79

EXPOSURE TO TOBACCO CONTENT IN TV/STREAMING SHOWS AND SMOKING AND VAPING INITIATION

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The relationship between exposure to tobacco in movies and youth/young adult smoking is known. However, less is known about the impact of tobacco exposure via TV/streaming shows. The evolving media landscape highlights the need to understand tobacco exposure across platforms. This study assessed the relationship between exposure to tobacco in Netflix and broadcast/cable TV shows and combustible tobacco smoking and vaping initiation. Members of a national, longitudinal cohort (age 15-21 at baseline) who participated in wave 7 (Feb-May 2018) and wave 8 (Feb-May 2019) (N=9,381) reported viewership for a list of TV/streaming shows that were previously identified as top shows from an online survey and Nielsen data, and were analyzed for the presence of tobacco. Participants were assigned a tobacco exposure value (none/low/medium/high) based on the amount of each show they reported watching (e.g., less than 1 episode, at least 1 full season) and the quantity of tobacco in that show. Outcomes were assessed at wave 8 and included initiation of combustible tobacco use and initiation of e-cigarette use. The analytic sample was restricted to those who reported



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never using any tobacco product or e-cigarette at wave 7 (n=4,605). Logistic regression models assessed associations between tobacco exposure and outcomes, controlling for demographics, household smoking, sensation seeking, and anxiety. Compared with those with no tobacco exposure through the TV/streaming shows sampled, those with low, medium, or high exposure had significantly higher odds of initiating e-cigarette use (OR(low)=2.19, $p < .001$; OR(medium)=2.22, $p < .01$; OR(high)=3.20, $p < .001$). A dose response for the effect on vaping initiation was observed, whereby the higher the exposure level, the greater the effect size. There were no significant effects for smoking initiation. Results suggest that exposure to tobacco through TV/streaming shows impacts young people's initiation of e-cigarette use. Future research should examine smoking and vaping behavior at longer follow-up times. Policy and advocacy efforts are needed to decrease tobacco exposure through TV/streaming shows.

FUNDING: Other

PS2-80

US TEACHERS' AND SCHOOL ADMINISTRATORS' KNOWLEDGE AND POLICY EXPERIENCES WITH STUDENT JUUL AND OTHER E-CIGARETTE USE

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Significance: E-cigarette use among US middle school (MS) and high school (HS) students has dramatically increased since 2015, with school personnel (SP) feeling burdened by it. However, little is known about SP's knowledge and experiences related to student e-cigarette use. **Methods:** Data were obtained in November-December 2018 from a national sample of US MS and HS teachers and administrators (school personnel). Logistic regression models examined the association of perceived frequency of students being caught with e-cigarettes with 1) JUUL name/photo recognition and 2) speaking with students about e-cigarette avoidance. Among SP with a school e-cigarette/JUUL policy, logistic regression models examined policy training and the association with 1) JUUL name/photo recognition, 2) speaking about e-cigarette avoidance, and 3) perceived frequency of students caught with e-cigarettes. **Results:** 1349 SP were surveyed. SP who perceived students were caught with e-cigarettes occasionally (OR=6.6; CI: 4.8, 9.1) or often (OR=8.3; CI: 5.3, 13.0), compared with never, had higher odds of JUUL recognition. SP who perceived students were caught with e-cigarettes occasionally (OR=1.5; CI: 1.1, 2.0) or often (OR=3.7; CI: 2.6, 5.4), compared with never, had higher odds of speaking with students about e-cigarette avoidance. Among SP with a school policy, SP with policy training compared to those without had higher odds of recognizing JUUL (OR=2.0; CI: 1.4, 2.8), talking to students about e-cigarette avoidance (OR=3.8; CI: 2.9, 5.0), and perceiving students were caught using e-cigarettes occasionally (OR=2.3; CI: 1.6, 3.3) and often (OR=4.4; CI: 2.9, 6.7) compared with never. Models controlled for school enrollment, perceiving student e-cigarette use as a problem, having a policy/policy training, and SP's tobacco use status. **Conclusion:** SP perceiving a higher prevalence of student e-cigarette use may be more aware of and willing to intervene on student use. With the high level of adolescent e-cigarette use, there is a need to increase awareness of e-cigarettes among all SP. E-cigarette policies alone are not sufficient; training school personnel may better equip them in addressing student use.

FUNDING: Other

PS2-81

MEDIA SOURCES INTERACT IN EFFECTS OF E-CIGARETTE FLAVOR COVERAGE ON YOUTH AND YOUNG ADULT PERCEPTIONS

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Significance: In order to inform e-cigarette marketing policy, it is necessary to investigate how specific themes of e-cigarette coverage influence perceptions and behavior among youth and young adults (YYAs). Flavor appeals for e-cigs are a common marketing theme. We know the belief that e-cigarettes taste good was highly associated with intentions to vape among 13-26 year old non-vapers (OR=2.68; 99% CI, 2.14-3.36). The present study investigates whether Twitter and news media coverage of e-cigarette flavor predict this YYA e-cigarette taste belief. **Methods:** We used validated search terms to code 27,452,989 e-cigarette related tweets and 11,691 e-cigarette related long form (website, newspaper, and broadcast news) texts disseminated between 12/2014-12/2017 for incidence of coverage pertaining to e-cigarette flavors; almost all texts said or implied that e-cigarettes taste good. Over the same period, we surveyed 4470 YYAs (~30/week) about perceptions of e-cigarette taste. Using ordinal logistic regression clustered by interview date, we assessed the association of exogenously

measured past 28-day e-cigarette flavor-related media coverage with survey-reported beliefs that e-cigarettes taste good (agreement scale 1-4). **Results:** While neither Twitter nor long form coverage had an overall main effect, the interaction of coverage from both sources predicted increased favorable taste perceptions ($B = .19$; 95% CI, .04-.34). Predicted agreement that e-cigarettes taste good was 60.8% when related content from both sources was high (+1sd) compared to 54.7% at mean content levels. Additionally, among Twitter and news users, source-specific coverage was significantly associated with higher belief. **Conclusions:** This study assesses the effects of two types of media sources, Twitter and long form, on YYA e-cigarette perceptions. We show that overall effects of coverage depend on concurrent coverage across sources. Our findings indicate that high levels of flavor-related e-cigarette media coverage can influence a belief that, in turn, is associated with YYA intentions to initiate vaping. These results have important implications for e-cigarette marketing policy.

FUNDING: Federal

PS2-82

POPULATION PREVALENCE AND PREDICTORS OF SELF-REPORTED EXPOSURE TO COURT-ORDERED, TOBACCO-RELATED CORRECTIVE STATEMENTS

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Significance: In 2017, the three major U.S. tobacco companies - Altria; its subsidiary Philip Morris USA; R.J. Reynolds Tobacco; and ITG Brands - were ordered by the U.S. District Court for the District of Columbia to publish corrective statements as one of four legal remedies originally included in a 2006 judgment to "prevent and restrain" tobacco companies from continuing to engage in fraud about the harms of cigarettes. After an 18-year legal battle, the U.S. government won the case, and implementation of the corrective statements in newspapers and on television began in November 2017. **Objective:** To describe the population prevalence and predictors of exposure to court-ordered tobacco-related corrective statements in 2017-2018, when they were first implemented in newspapers and on television. **Methods:** Nationally-representative data from the 2018 Health Information National Trends Survey (HINTS) were utilized (N=3504). Frequencies and weighted proportions were calculated for seeing any corrective statement and for each of the five court-ordered corrective statements. Weighted, multivariable logistic regression was used to examine sociodemographic and smoking status predictors of exposure to any corrective statement. **Results:** In 2018, 40.6% of U.S. adults reported that in the past 6 months, they had seen messages in newspapers or on television stating that a Federal Court has ordered tobacco companies to make statements about the dangers of smoking cigarettes. Exposure to topic-specific statements ranged from 11.4% (manipulation of cigarette design) to 34.7% (health effects). Those with a high school education were significantly less likely than those with a college degree to report seeing the statements (OR=0.69, CI 0.50-0.95) and current smokers were significantly more likely than never smokers to report seeing the statements (OR 1.68, CI 1.12-2.53). **Conclusions:** In the first six months of corrective statement implementation, an estimated 40.6% of U.S. adults reported exposure to at least one statement, and current smokers were more likely than never smokers to report exposure. Court-ordered remedies involving dissemination through television and print media can be effective for tobacco-related messages; however, they may fail to reach half of the adult population without targeted communication efforts.

FUNDING: Federal

PS2-83

USING AGGREGATE TEMPORAL VARIATION IN AD AWARENESS TO ASSESS THE EFFECTS OF THE TRUTH® CAMPAIGN ON YOUTH AND YOUNG ADULT SMOKING BEHAVIOR

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Mass media campaigns are one of the most effective population-level interventions for the prevention of tobacco use. However, accurately evaluating the effectiveness of these campaigns presents several challenges, particularly as campaign delivery becomes increasingly fractured across media platforms. There are a number of weaknesses associated with traditional, individual-level measures of campaign exposure in an increasingly socially networked, digital media ecosystem. Specifically, mass media now airs across television, digital, and social media platforms, making traditional exogenous measures of campaign exposure (e.g., television (TV) gross rating points (GRPs) that



typically rely on variability by geography between media markets less able to capture accurate variability in exposure. This study evaluated the promise of a novel method for media campaign evaluation by measuring campaign exposure with an aggregate, weekly exogenous measure of awareness. We generated this exogenous measure from a continuous, rolling-cross sectional advertisement tracking survey to predict intentions to smoke and current tobacco use among youth and young adults in the United States. Results indicated that weeks with aggregate campaign awareness greater than 65% were associated with lower odds of current tobacco use, while weeks of aggregate awareness levels of greater than 70% were associated with lower intentions to smoke. The analysis suggests that aggregated, weekly measures of ad awareness can serve as a valid indicator of campaign exposure for media campaign evaluation in a complex digital and socially networked media environment.

FUNDING: Other

PS2-84

NON-CIGARETTE TOBACCO PRODUCT USE AMONG SUSCEPTIBLE AND NON-SUSCEPTIBLE ADOLESCENT NEVER SMOKERS, 1999-2018

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Significance: Susceptibility to cigarette smoking, a predictor of future daily smoking, has been studied solely in relation to cigarette smoking. With growing rates of smoking susceptibility among adolescent never smokers and the popularization of non-cigarette tobacco products, especially e-cigarettes, we examined non-cigarette tobacco product use among susceptible and non-susceptible adolescent never smokers. **Methods:** Data came from 205,056 adolescent never smokers from 14 waves of the National Youth Tobacco Survey (NYTS, 1999-2018). We examined the relation between susceptibility to cigarette smoking and three exclusive tobacco product use patterns (T-PUPs): non-cigarette combustible use, noncombustible use, and dual use (i.e., non-cigarette combustible and noncombustible product use), controlling for sociodemographic characteristics and survey year. Using joinpoint regression analysis, we examined whether the prevalence of non-cigarette T-PUPs changed significantly over time among susceptible and non-susceptible adolescents and projected T-PUP prevalence for 2019 to 2021. **Results:** Non-cigarette combustible (*adjusted odds ratio [aOR]* = 2.53), noncombustible (*aOR* = 3.46), and dual users (*aOR* = 4.31) were more likely to be smoking susceptible than non-users. Noncombustible use peaked among susceptible and non-susceptible adolescents in 2018 at 14% and 4%, with projections of 36% and 8% for 2021. Noncombustible use among susceptible and non-susceptible adolescents rose significantly from 1999-2018 with an average annual percent change of 13.3 and 12.4, respectively. No changes were observed from 1999-2018 in the rates of non-cigarette combustible and dual users among susceptible nor non-susceptible adolescents. **Conclusions:** Non-cigarette tobacco product use is associated with smoking susceptibility. Rising and projected rates of exclusive noncombustible use among susceptible adolescents are alarming. The cross-sectional nature of NYTS prevented us from establishing causation between susceptibility and non-cigarette T-PUPs, but results suggest tobacco control efforts should target susceptible never smokers.

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PS2-85

JUUL USE IS HIGHER AMONG COLLEGE STUDENTS THAN THEIR SAME-AGE PEERS

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Over the last several years, significant progress has been made in reducing combustible tobacco use among young adults. However, with newer, trendier tobacco products, like e-cigarettes and JUUL on the rise, this trend is threatened to be reversed. JUUL has dominated the e-cigarette market since its introduction in 2015. By June 2019, JUUL's sales accounted for almost 75% of the e-cigarette market share. Historically, young adults have been at high risk for tobacco product initiation, given that they comprise the youngest age group tobacco companies can legally target for marketing efforts. Prior research indicates that the tobacco industry intentionally targets college campuses because of their large population of young adults. While 4-year college students are typically at lowest risk for combustible product use, these same students may be at greater risk for using non-traditional tobacco products like e-cigarettes. This study examines JUUL use among college-age (18-24) young adults over a two-year-period of rising JUUL sales (July 2017-June 2019). Data were collected from a national continuous tracking survey, with daily surveys conducted among 140 participants per week. Both ever- and

past 30-day JUUL use increased dramatically over 24 months, coinciding with the rise of JUUL in the marketplace. Ever-use among all young adults increased rapidly, from 1.6% in July 2017 to 30.1% in June 2019. Among those who were currently enrolled in school, ever-JUUL use increased from 2.5% in July 2017 to 35.2% in June 2019 and stayed consistently and significantly higher than among those who were not currently enrolled ($z=6.78$; $p<.001$), which increased from 0.4% to 25.8% over the same time. The significant difference between students and non-students is notable given that there are no differences in prevalence of use during these two years for other demographic subgroups such as between male (12.1%) and female (12.2%), between LGBTQ (12.6%) and heterosexual (12.3%), or between urban (11.3%) and rural (12.6%) (all $p's>.05$). Results can inform counter-marketing campaigns and potential marketing restrictions for young adult populations as well as college campus policy makers.

FUNDING: Other

PS2-86

COLLEGE STUDENTS PERCEPTIONS ABOUT JUUL AND NICOTINE ADDICTION

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Introduction: Since their inception into the US market, JUUL has quickly become the most popular pod-based e-cigarette device among young populations. Although research findings suggest that those who initiation tobacco via electronic cigarettes (e-cigarettes) are more susceptible to transitioning to other tobacco products, such as conventional cigarettes, no current studies have examined the association between JUUL addiction and the use of conventional cigarettes among college students. **Methods:** Undergraduate current JUUL users ($n=608$) from a large southwestern University completed a cross-sectional online survey in March 2019. In addition to demographics questions, close-ended measures included ever use and past 30 days use of JUULs, and an adapted version of the Penn State Electronic Cigarette Dependence Index. Logistic regression was used to examine the association between JUUL dependence and use of conventional cigarettes (ever use and past 30-day use), controlling for covariates (i.e., gender, race, sexuality, age they first tried a JUUL, and number of pods used per week). **Results:** Overall, 47.7% of the participants were male, 74.2% were non-Hispanic white, and average age was 20.28 years ($SD=1.40$, range 18-24). All participants owned a JUUL and 48.2% used a JUUL every day. Risk factors for ever use of conventional cigarettes among current JUUL users included older age (22-24 years compared to 18-19 years; $OR=3.90$, 95% $CI: 1.49-10.22$), male gender ($OR=1.83$, 95% $CI: 1.20-2.78$), as well as moderate ($OR=1.90$, 95% $CI: 1.02-3.54$) and high ($OR=8.44$, 95% $CI: 3.18-22.43$) dependence scores to JUUL. Risk factors for past 30-day use of cigarettes were similar for age, race, and past 30-day use of Hookah or Water Pipe ($OR=2.89$, 95% $CI: 1.21-6.95$). Those who would not call someone a smoker who smoked a few cigarettes a week but used JUUL most days were 2.3 times more likely to have smoked in the past 30 days. Protective factors that reduced odds of past 30-day use of cigarettes included trying JUUL after 18 years ($OR=0.48$, 95% $CI: 0.24-0.96$) and after 21 years of age ($OR=0.17$, 95% $CI: 0.05-0.55$). **Conclusions:** Young adult populations who initiate their nicotine addiction via JUULs may experiment or become more dependent users of other tobacco products, such as cigarettes. Health messages regarding JUUL addiction and the transition to other tobacco products, such as cigarettes, are needed to inform those working to protect young populations from tobacco initiation and use.

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PS2-87

CHANGES IN UTILIZATION AND COSTS OF CESSATION MEDICATIONS AMONG PRIVATELY INSURED U.S. ADULTS, 2010-2017

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Significance: Approximately two-thirds of cigarette smokers are interested in quitting, but fewer than one-third use evidence-based cessation treatments when trying to quit. In 2017, 10.5% of U.S. adults with private insurance currently smoked cigarettes; however, little is known about utilization and costs of cessation medications in this population. This study assessed changes in utilization and costs of FDA-approved cessation medications among adults with private insurance between 2010 and 2017. **Methods:** Data came from the MarketScan Commercial Claim and Encounter database. The analysis included adults aged 18-64 years in 2010 and 2017 who were fully enrolled in a fee-for-service plan, had prescription drug coverage, and were not pregnant in a calendar year. Claims for five FDA-approved nicotine replacement therapies (nicotine



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gum, patch, lozenge, inhaler, and nasal spray) and two non-nicotine medications (bupropion and varenicline) were assessed. Mean annual number of fills/refills and days of supply were estimated using a negative binomial regression and costs (for payer and out-of-pocket) (in 2017 dollars) using generalized linear models, controlling for year, age, sex, location, and benefit plan. Marginal effects were estimated to compare 2010 versus 2017 results. **Results:** Between 2010 and 2017, the proportion of adults receiving cessation medications increased 13.5% (2.4% to 2.7%; $p < 0.001$). Among adults receiving any medications, mean annual number of fills/refills increased 2.8% (3.3% to 3.4%; $p < 0.001$) and days of supply increased 13.4% (125 to 142; $p < 0.001$). Mean annual costs decreased 16.8% (\$366 to \$305; $p < 0.001$). Costs increased for nicotine inhaler, nasal spray and varenicline, but decreased for the other cessation medications. **Conclusions:** Between 2010 and 2017, receipt of cessation medications covered by private insurance increased among privately insured U.S. adults, while associated costs of these medications decreased. However, overall receipt of covered medication was low. These findings can help inform efforts to improve insurance coverage and use of cessation medications, as well as to assess the economic impact of these changes.

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PS2-88

E-CIGARETTE USE AND RISK OF CIGARETTE AND SMOKELESS TOBACCO INITIATION AMONG ADOLESCENT BOYS

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SIGNIFICANCE. Electronic cigarette (e-cigarette) use among adolescents is associated with increased risk of subsequent cigarette smoking initiation in observational research. However, the existing research was not designed to answer causal questions about whether adolescent e-cigarette users would have initiated cigarette smoking if they had never used e-cigarettes. The current study used a causal inference framework to identify whether male adolescent e-cigarette users were at increased risk of initiating cigarette smoking and smokeless tobacco (SLT) use, compared to similar boys who had never used e-cigarettes. **METHODS.** Boys from urban and rural Appalachian Ohio ($N=1220$; ages 11-16 years at enrollment) reported use of e-cigarettes, cigarettes, and SLT at baseline and every six months for two years. A propensity score matched analysis, completed in 25 multiple imputation datasets, matched one e-cigarette user to two similar e-cigarette non-users. Risk ratios (RRs) comparing risk of initiating cigarettes and SLT for e-cigarette users and nonusers were estimated. **RESULTS.** Compared to non-users, e-cigarette users were over twice as likely to later initiate ever cigarette smoking ($RR=2.71$; 95% CI: 1.89, 3.87) and SLT use ($RR=2.42$; 95% CI: 1.73, 3.38). They also had greater risk of becoming current cigarette smokers ($RR=2.20$; 95% CI: 1.33, 3.64) and SLT users ($RR=1.64$; 95% CI: 1.01, 2.64). **CONCLUSION.** E-cigarette use increased the risk of initiating both cigarettes and SLT in a cohort of adolescent boys who were balanced on risk factors for e-cigarette use. Findings extend the existing evidence that e-cigarettes increase the risk of initiating other harmful tobacco products and support public health interventions to decrease adolescent e-cigarette use. **FUNDING.** This study was funded by the National Cancer Institute and the Food and Drug Administration Center for Tobacco Products (P50CA180908).

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PS2-89

PREDICTORS OF JUUL, OTHER E-CIGARETTE PRODUCT, AND COMBUSTIBLE TOBACCO INITIATION AMONG TEXAS YOUTH

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Significance: In 2018, there was a 78% increase in e-cigarette use among youth largely due to the rise in popularity of JUUL. To date, there is limited research examining differences in factors associated with initiation of use across tobacco product types. This study examined predictors of JUUL, other e-cigarette product, and combustible tobacco initiation among a cohort of Texas youth. **Methods:** Data were drawn from Waves 7 and 8 of the Texas Adolescent Tobacco and Marketing Surveillance System. Participants were 14-18 year olds ($n=2,543$) from the four largest cities in Texas. Multinomial logistic regression analyses examined the associations between Wave 7 predictors and tobacco use initiation groups at Wave 8. **Results:** Among non-users of any product at Wave 7 ($n=1,325$), 91.9% remained non-users, 3.3% initiated JUUL, 3.6% initiated other e-cigarette products, and 1.3% initiated combustible tobacco at Wave 8. Ever marijuana use was significantly associated with increased risk of initiation of all tobacco products (Risk Ratios "RRs" from 2.47-4.32). Male sex ($RR=2.02$, 95%

CI=1.05-3.87); White, non-Hispanic race ($RR=2.54$, 95% CI=1.27-5.08); susceptibility to any tobacco product use ($RR=2.81$, 95% CI=1.35-5.87); peer tobacco use ($RR=3.17$, 95% CI=1.43-7.01); ever marijuana use ($RR=2.94$, 95% CI=1.24-6.96); and higher self-reported exposure to e-cigarette marketing ($RR=1.53$, 95% CI=1.11-2.09) were associated with significantly higher risk of JUUL initiation compared to non-use. White, non-Hispanic race ($RR=3.83$, 95% CI=1.10-13.28), and higher self-reported exposure to e-cigarette marketing ($RR=1.97$, 95% CI=1.03-3.78) were significantly associated with higher risk of initiation of JUUL compared to combustible tobacco. Risk factors for initiating other e-cigarette products compared to non-use included peer tobacco use ($RR=4.09$, 95% CI=1.76-9.47), past 30-day alcohol use ($RR=2.39$, 95% CI=1.16-4.97), and ever marijuana use ($RR=2.47$, 95% CI=1.15-5.30). Only ever marijuana use ($RR=4.32$, 95% CI=1.36-13.71) was a significant risk factor for initiating combustible tobacco use compared to non-use. **Conclusion:** Comparing predictors across tobacco product types provides important information on differential risk factors for the initiation of use. As marijuana use was associated with initiation of all tobacco products, future prevention efforts should target marijuana users to prevent transition to tobacco use. Future research should also examine the role of JUUL-specific marketing on initiation behaviors among youth.

FUNDING: Federal

PS2-90

COMPARING SUBJECTIVE AND OBJECTIVE MEASURES OF EXPOSURE TO AN ANTI-VAPE CAMPAIGN AMONG VAPERS AND NON-VAPERS

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Mass media campaigns are effective tobacco prevention tools. The shift in media use from traditional TV to a fragmented digital space complicates campaign evaluation. No objective metrics can capture all exposure, and evaluators rely on self-reported ad recall without knowing how it varies with the number of exposures. Further, self-report may be subject to bias. This study quantified the relationship between number of digital truth® anti-vape ad impressions served to an individual, their probability of ad recall, and truth brand equity. Further, we tested if relationships differed among vapers and non-vapers. Participants ($N=415$, age 18-34) were members of Dynata's opt-in cookie panel. Those who were served a truth ad as part of their natural web activity were randomly selected to receive a survey to be completed within 48 hours. The survey assessed vape use, truth brand equity (a measure of brand affinity shown to mediate the impact of ads on behavior), and self-reported ad recall. Regression models assessed how 1) ad recall was related to vaping status and number of impressions served, and 2) truth brand equity was related to vaping status, impression count and subjective recall. Self-reported recall was linearly related to the number of impressions served (range = 1-69). Odds of recall increased by 6% for each impression ($OR=1.06$, 95% CI: 1.01-1.10). Vaping status did not affect ad recall, nor did it interact with the number of impressions on ad recall. Higher brand equity was associated with self-report recall ($b=0.28$, 95% CI: 0.12-0.03) and never vaping ($b=-0.33$, 95% CI: -0.50--0.03), but not with number of impressions; there were no significant interactions between vaping status and either measure of exposure. Results support the use of self-report for evaluation of mass media campaigns. The objective of the truth anti-vape campaign is to change the course of the vaping epidemic among young people by preventing initiation and escalation of use. Importantly, these findings suggest that both vaping and non-vaping young adults are attending to the campaign ads, the first step to those ads impacting their vaping behavior.

FUNDING: Other

PS2-91

ANTI-TOBACCO CAMPAIGN EFFECTIVENESS - EXPLORING DIFFERENCES BY DEMOGRAPHIC SUBGROUPS

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Background: Prior research has found the national, counter-tobacco truth® campaign to be effective at reducing tobacco use among the general U.S. population of youth and young adults. This effect occurs through changes in anti-tobacco and pro-social movement attitudes that are the focus of campaign messages. However, given the disparities in tobacco use by demographic characteristics, it is critical to assess campaign effectiveness among demographic subgroups to ensure the campaign is impacting those most at risk for tobacco use. **Methods:** Data come from a national, longitudinal sample of youth and young adults (ages 15-21 at baseline). Data were collected online from 2014 to 2016 in 6-month intervals. The analytic sample included those who complet-



ed at least 2 waves of data collection and had never smoked a cigarette at baseline (n=8747). Structural equation modeling tested causal pathways from awareness of the truth campaign to smoking intensity (measured based on quantity and frequency of cigarette use), with pathways through attitudes that were the target of campaign messages. The sample was stratified by age (15-17, 18-21), race/ethnicity (NH white, NH black, NH other, Hispanic), gender (male, female), and perceived financial situation (live comfortably, meet needs with a little left over, just meet basic expenses, don't meet basic expenses), and models were run among each subgroup. **Results:** Findings were consistent across all subgroups. Greater awareness of the truth campaign was associated with greater agreement with anti-tobacco attitudes; greater agreement with anti-tobacco attitudes was associated with greater support for an anti-tobacco social movement; and greater support for an anti-tobacco social movement was associated with slower smoking progression. **Conclusions:** Results suggest that truth campaign messages are effective at changing youth and young adult's attitudes, which in turn reduce tobacco use. These findings are consistent across age, gender, racial/ethnic, and financial situation subgroups.

FUNDING: Other

PS2-92

EVER, CURRENT, AND FREQUENT E-CIGARETTE USE AMONG NEVER SMOKER YOUTH, 2014-2018

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Significance: E-cigarette use among youth increased dramatically from 2017 to 2018, but the extent to which new users of e-cigarettes are also non-users of other tobacco products is unknown. While frequent e-cigarette use is increasing, it is not clear whether this is occurring among youth never smokers. **Methods:** We report National Youth Tobacco Survey (NYTS) data on ever and past 30-day tobacco use by the combination of product(s) used and e-cigarette use frequency by smoking status from 2014-2018 among high school (HS) and middle school (MS) students. We used chi-squared tests to examine year-to-year changes and JoinPoint regression to assess annual percent change (APC) trends in the proportion of youth who only used e-cigarettes but not combustible (cigarettes, cigars, pipe, hookah, or bidis) or smokeless tobacco. **Results:** In 2018, most never smoker youth did not use e-cigarettes in the past 30 days (HS = 88.3%, 95% CI: 86.8-89.9; MS = 97.2%, 95% CI: 96.6-97.8) or used them infrequently on 1-5 of the past 30 days (HS = 7.5%, 95% CI: 6.5-8.5; MS = 2.1%, 95% CI: 1.7-2.6); whereas most current smoker youth used e-cigarettes in the past 30 days (HS = 71.0%, 95% CI: 65.9-75.6; MS = 72.8%, 95% CI: 64.9-79.5). Frequent use of e-cigarettes (≥20 of past 30 days) among HS never smokers increased from 0.5% (95% CI: 0.3-0.7; ~50,000 students) in 2017 to 1.6% (95% CI: 1.1-2.0; ~170,000 students) in 2018. From 2014 to 2018, past 30-day use of only e-cigarettes increased significantly among HS students who never used combustible tobacco (APC = +42.4%; 2014 = 1.4%, 95% CI: 1.0-2.1; 2018 = 5.7%, 95% CI: 4.8-6.8). Among all HS students, past 30-day use of combustible tobacco only declined significantly (APC = -14.5%; 2014 = 7.9%, 95% CI: 6.9-8.9; 2018 = 4.0%, 95% CI: 3.4-4.8). **Conclusions:** National estimates of youth e-cigarette use can mask large differences by smoking status. Most never smoker youth are not using e-cigarettes, but a minority are using them frequently and this rose significantly from 2017 to 2018. While high school combustible tobacco use declined from 2014-2018, use of only e-cigarettes increased among never smokers.

FUNDING: Federal

PS2-93

TOBACCO INTERVENTION PROGRAMS - ONE SIZE DOES NOT FIT ALL

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Background Maternal smoking during pregnancy and exposure to second hand smoke are factors which contribute to a variety of health risks for both mother and child. However, due to perceived barriers by healthcare teams, providing effective interventions in maternal and newborn health settings throughout the continuum of care is not always standard practice. While provider's impact is greatest through the recommended 5-A's, this model is not always possible. **Methods** We sought to evaluate the effectiveness of implementing various tobacco cessation guidelines in 3 clinical settings. We assessed strengths and barriers to implementation and developed Tobacco intervention models tailored to fit the individual setting which all show promise. These included a provider-driv-

en model in the High Risk Obstetrical Clinic, the staff-provider/self-assessment model in the Neonatal Intensive Care at the Children's Hospital and the non-provider driven self-assessment model in The Children's Heart Center Clinic. **Results** The study period includes data from May 2018 thru December 2018. Patients at the High Risk Obstetrical Clinic were screened for tobacco use and provided a modified intervention model by the healthcare provider; of those screened positive for use and given this intervention, 88% accepted a referral to the Oklahoma Tobacco helpline. Caregivers/parents of babies in the Neonatal Intensive Care Unit at The Children's Hospital, were screened for tobacco use and were provided a staff-provider/self-assessment intervention model; of those screened and reporting use with the staff-provider/self-assessment hybrid model, 53% requested a referral to the Helpline. At The Children's Hospital, Heart Center Clinic 43% of caregivers/patients who disclosed tobacco use using a non-provider self-assessment model requested a proactive referral to the Helpline. As compared with the 2018 Joint Commission Tobacco Treatment Quality Measures, All 3 intervention models had degrees of success above the national average for referrals to the tobacco helpline. **Conclusion** Implementing a successful tobacco intervention process need not be labor intensive. However, the common denominator in each practice included asking, advising and importantly, assistance to interventions (referral to HELPLINE). Individualizing implementation to fit into specific clinical flow will support success and sustainability.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PS2-94

SMOKING AND VAPING: ASSESSMENT OF CIGARETTE USE IN PATIENTS AT A LARGE ACADEMIC DENTAL SCHOOL CLINIC

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Significance. Implementation of smoking cessation interventions in dental settings is low, despite evidence indicating that even brief cessation treatment provided by dental professionals is effective and accepted. The purpose of the current study was to gather preliminary data in preparation for a multi-disciplinary implementation project aimed to improve dental providers' participation in smoking cessation efforts. **Methods.** Participants were recruited from patients seeking dental services at the UTHealth School of Dentistry and represented a convenience sample of adults willing to complete a brief (< 15 minute), anonymous survey. The survey evaluated socio-demographics, past and current use of combustible and electronic (e-) cigarettes, health concerns, and interest in quitting. **Results.** Patients (n=207, 40% male, 60% female) of all ages, races, and socioeconomic backgrounds completed the survey. Eleven percent of the patients smoked cigarettes in the past month, 2.4% used e-cigarettes in the past month, and 2% used both. The prevalence of daily smoking was 11% for cigarettes, 1% for e-cigarettes, and 1% for both. There were no differences related to age, race/ethnicity, income, or educational attainment among cigarette smokers and non-smokers. Among e-cigarette users, 33% used JUUL, 67% preferred sweet or fruity flavor, and 36% did not know the nicotine level of their e-cigarette. Both smokers and e-cigarette users expressed concerns about the potential effects of tobacco on their dental and overall health. Almost 50% of the cigarette smokers and 22% of e-cigarette users indicated desire to quit. **Conclusions:** The prevalence of cigarette smoking and desire to quit among dental patients was comparable to that of the general population. Thus, the public health benefits of tobacco cessation interventions within the dental setting are potentially significant. Dental providers are urged to use the dental visit as a window of opportunity to help their patients quit using tobacco or nicotine products. Due to the changing tobacco landscape, dental providers should screen for and advise patients regarding the effects of new tobacco products, including e-cigarettes.

FUNDING: Unfunded

PS2-95

PATTERNS OF CO-USE OF TOBACCO AND MARIJUANA AND ASSOCIATIONS WITH TOBACCO DEPENDENCE AND HAZARDOUS MARIJUANA USE

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Significance: Co-using tobacco and marijuana (MJ), either simultaneously (using products with both substances or "chasing" MJ with tobacco to enhance a high) or concurrently (using both without mixing or chasing), results in additive physical and psychosocial risks. Although co-use is common, there is little research differentiating patterns of co-use or the associations of those patterns with problems like dependence. **Methods:** In 2018-2019, we conducted 2 online surveys of adults aged ≥21 in states with



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legal recreational MJ. Study 1 included 2,978 adults who had used MJ, with or without tobacco, in the past 30 days; data were calibrated to the characteristics of MJ users from the 2016-2017 Behavioral Risk Factor Surveillance System. Study 2 included 500 adults who had used tobacco but not MJ in the past 30 days; data were not calibrated. We used logistic regression models to examine the association of co-use type with hazardous MJ use (score ≥ 8 on the Cannabis Use Disorder Identification Test Revised) among Study 1 participants and the association of co-use type with tobacco dependence (score ≥ 5 on the Tobacco Dependence Screener) among Study 1 and Study 2 participants combined. Results: Most current MJ users had co-used with tobacco in the past 30 days simultaneously (14%), concurrently (6%), or both (54%). Relative to MJ-only users, adults who co-used simultaneously (OR=1.98) or both simultaneously and concurrently (OR=3.91) were more likely to exhibit hazardous MJ use; there were no differences in hazardous MJ use between MJ-only users and concurrent-only co-users. Adults who co-used were less likely to be tobacco dependent than tobacco-only users (OR=0.05 for simultaneous, OR=0.43 for concurrent, and OR=0.77 for simultaneous and concurrent co-use). Conclusion: Although co-users were less likely to be dependent on tobacco than tobacco-only users, simultaneous use of tobacco and MJ was positively associated with hazardous MJ use. As more states legalize MJ, co-use is likely to increase. These results suggest that consideration of new tobacco product regulations should include their potential impact not only on tobacco use, but also on tobacco and MJ co-use.

FUNDING: Federal

PS2-96

EFFECT OF RISK MESSAGES ON RISK APPRAISALS, ATTITUDES, AMBIVALENCE, AND WILLINGNESS TO SMOKE HOOKAH IN YOUNG ADULTS

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Significance: Brief but effective public health communication messages are needed to reduce the burgeoning use of hookah tobacco among young adults. Although emphasizing the risks of tobacco use is a common messaging strategy, little is known about the cognitive and affective substrates of the effects of hookah tobacco risk messages. **Methods:** In an online experiment, young adult hookah smokers aged 18-30 years ($n=234$) completed a pretest and were then randomly exposed to either hookah tobacco risk messages communicating short-term health risks, long-term health risks, and addictiveness, or no messages. Posttests included hookah tobacco risk appraisals, attitudes toward hookah use, ambivalence about using hookah, and willingness to smoke hookah again. **Results:** Hookah smokers who viewed risk messages reported greater risk appraisals ($M 4.50, SD 1.17$ vs. $M 3.87, SD 1.16, p < .001$), less positive attitudes ($M -0.56, SD 1.24$, vs. $M 0.39, SD 1.35, p < .001$), greater ambivalence ($M 3.86, SD 1.26$, vs. $M 3.08, SD 1.32, p < .001$), and less willingness to smoke than controls ($M 4.48, SD 1.27$, vs. $M 4.85, SD 1.37, p = .034$). Structural equation modeling demonstrated how messages reduced willingness to smoke: by evoking less positive attitudes ($b = -0.15, 95\% CI -0.32, -0.05$) and by the effect of heightened risk appraisals on less positive attitudes ($b = -0.14, 95\% CI -0.30, -0.07$). **Conclusions:** Risk-based messaging continues to be effective at modifying mental precursors of hookah use behavior. Honing messages and understanding their mechanisms of action are necessary steps in producing more effective interventions to address the growing burden of hookah and other tobacco use in young adults.

FUNDING: Federal

PS2-97

ADOLESCENTS' PRODUCT USE AS A FUNCTION OF ELECTRONIC CIGARETTE EXPECTANCIES

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Background: Whereas expected costs and benefits of smoking are reliable predictors of cigarette initiation and escalation, less work has examined such expectancies for electronic cigarettes (ECIGs), particularly with adolescents. Among adults, higher benefit and lower cost expectancies for ECIGs are associated with previous cigarette and/or ECIG experience. The purpose of the current analysis was to compare costs and benefits of ECIG use as a function of product use status among adolescents. **Methods:** Middle and high school students ($n=582$; $M_{age} = 15.88$ years; 82.7% Caucasian; 60.1% female) from central-northern Appalachia were classified into one of three

groups based on their lifetime use of both cigarettes and ECIGs (dual users; 21.8%), only ECIGs (ECIG users; 16.5%), or neither product (nonusers; 57.4%). Participants completed an adapted version of the *Smoking Expectancy Scale for Adolescents*, in which they rated the likelihood of costs (appearance, social, health, addiction) and benefits (affect control, social, boredom reduction, weight control) associated with ECIG use. **Results:** For costs, greater social costs placed individuals at increased odds for being nonusers compared to dual users (OR=1.43, SE=.08) and ECIG users (OR=1.21, SE=.08), whereby appearance costs placed individuals at increased odds for being nonusers compared to ECIG users (OR=1.26, SE=.08). For benefits, individuals with greater boredom reduction expectancies were more likely to be dual users (OR=1.22, SE=.08) or ECIG users (OR=1.25, SE=.08) compared to nonusers. Greater affect control also placed individuals at greater odds for being dual users than nonusers (OR=1.35, SE=.08). All $ps < .05$. **Conclusions:** This pattern of results is generally consistent with prior research on expectancies for other tobacco products and/or in adult populations. Regulatory efforts should consider prevention and intervention strategies that challenge users' expectations of ECIG use (increase popularity; decrease stress and boredom).

FUNDING: Federal; Academic Institution

PS2-98

NATURAL COURSE OF NICOTINE DEPENDENCE AMONG ADOLESCENT WATERPIPE AND CIGARETTE SMOKERS: THE LONGITUDINAL STUDY OF WATERPIPE DEPENDENCE IN LEBANESE YOUTH

Mohammad Ebrahimi Kalan¹, Raed Bahelah², Zoran Bursac¹, Malak Tleis³, Mohammad Masudul Alam⁴, Taghrid Asfar⁵, Rima Nakkash³, Kenneth Daniel Ward⁴, Wasim Mazia¹. ¹Florida International University, Miami, FL, USA, ²Baldwin Wallace University, Berea, OH, USA, ³American University of Beirut, Beirut, Lebanon, ⁴University of Memphis, Memphis, TN, USA, ⁵University of Miami, Miami, FL, USA.

Background: Waterpipe's (WP) configuration, smoking patterns (long intermittent sessions) and setting (e.g. café and social environment) can result in a unique trajectory of nicotine dependence (ND) symptoms compared to cigarette smoking. This longitudinal study compared the development of ND symptoms among adolescent WP and cigarette smokers. **Method:** A cohort of 647 8th- and 9th-graders (mean [SD] age at baseline: 14.7 [1.6] years) from 38 schools in Lebanon were followed over 5 years with seven individual interviews. This study is based on 283 exclusive WP and 146 exclusive cigarette smokers who reported past-month smoking. The Kaplan-Meier survival analyses were conducted to evaluate 50% cumulative probability, following first puff and smoking a whole WP or cigarette, for the development of ND symptoms based on the 10-item Hooked on Nicotine Checklist (HONC). We obtained the median quantity and frequency of WP and cigarette use based on the order of appearance of HONC symptoms. **Results:** At least 1 HONC symptom was reported by 58.7% ($n=166$) of WP and 50% ($n=73$) of cigarette smokers after smoking initiation. Of the 166 symptomatic WP smokers, 50% reported experiencing ≥ 1 HONC symptom within 9.7 months after first puff and on the same day of smoking a whole WP (head/bowl). Of the 73 symptomatic cigarette smokers, 50% reported experiencing ≥ 1 HONC symptom within 18.5 months after first puff and 18.2 months after smoking a whole cigarette. Among WP smokers, a strong craving was the first most common reported symptom (19.1%) followed by feeling addicted (10.3%), failed quit attempt (6.0%) and strong urges to smoke (4.2%). For cigarette smokers, feeling addicted was reported as the first most common symptom (19.2%), followed by a strong craving (9.6%), failed quit attempt (5.6%), and feeling irritable (5.5%). The median quantity of use per month when the 1st HONC symptom appeared was 4 WPs and 15 packs of cigarettes which significantly increased to 16 WPs and 30 packs of cigarettes when 4th HONC symptom emerged ($p < .001$ for all). From endorsing 1st to 4th HONC symptoms, the median frequency of WP use significantly increased from 5 to 20 days/month ($p < .001$), and no significant difference was found for cigarette smokers (30 days/month; $p > .05$). **Conclusion:** Compared to adolescent cigarette smokers, ND symptoms can develop sooner after starting to smoke and progress more rapidly among adolescents WP smokers with relatively low frequency and quantity of use. Intervention programs addressing ND in adolescents WP smokers should be guided by WP-specific trajectory of ND.

FUNDING: Federal

**PS2-99****INFLUENCE OF TOBACCO MARKETING ON NEPALESE ADOLESCENTS: CIGARETTE USE AND SUSCEPTIBILITY TO CIGARETTE USE**

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Significance: Smoking is a worldwide leading risk factor for premature death and disability. Tobacco use is increasing and the prevalence of smoking is very high among Nepalese adolescents (10-14 years: 3.41% and 15-19 years: 16.74%). Studies show that tobacco advertising, promotion, and sponsorship (TAPS) are associated with adolescents tobacco-product use. We aim to assess the influence of TAPS on cigarette use and susceptibility to use cigarette among Nepalese adolescents. **Methods:** Data (n=2,878) were drawn from the 2011 Global Youth Tobacco Survey for Nepal (GYTS). Study outcomes were current cigarette use, ever cigarette use, and cigarette use susceptibility among never users. Channel-specific and cumulative TAPS exposure were the primary exposures of the study. Weighted multivariable logistic regression models were computed to examine the relationship. **Results:** The prevalence of ever and current cigarette smoking, and susceptibility to use cigarette were 12.78%, 5.0%, and 17.22% respectively. Indirect TAPS exposure increased the ever use (Adjusted odds ratio (aOR)=1.90), current use (aOR=1.62) and susceptibility to use cigarette (aOR=1.72). TV and movie exposure increased ever (aOR=1.11) and current (aOR=5.36) use. Sponsored events increased the chances of ever use (aOR=1.11) and susceptibility of smoking (aOR=1.03). The outcomes were high with print media: ever use (aOR=1.06), current use (aOR=1.34) and susceptibility to use cigarette (aOR=1.14), and billboards: ever use (aOR=1.05), current use (aOR=1.85) and susceptibility to use (aOR=1.09). Compared to two or fewer sources of TAPS, five sources increased the odds of ever use (aOR=1.68), current use (aOR=2.80) and susceptibility to use cigarette (aOR=1.44). **Conclusion:** We found a high prevalence of cigarette use and susceptibility to use cigarette among Nepalese adolescents. TAPS exposure is positively associated with ever and current cigarette use, and susceptibility to use cigarette in the future.

PS2-100**COMPARING THE PREDICTIVE VALIDITY OF DIFFERENT METHODS OF ANALYZING FOUR SELF-REPORT TOBACCO USE INTENTION ITEMS AMONG YOUTH NEVER USERS AND YOUNG ADULT PAST 12-MONTH NON-USERS**

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Background: Researchers use self-report survey items measuring tobacco use intentions to predict future use. These items have been combined and analyzed using several methods; however, no research has compared the methods' predictive validity. **Aims:** To examine how well six methods of analyzing four intention items predict youth and young adult initiation of cigarettes, e-cigarettes, snus pouches, and other smokeless tobacco. These methods are: the susceptibility scoring method (not answering "definitely no" to all items is scored as susceptible); dichotomizing the 4-item average using two different cut points; and dichotomizing a single item (next year use intention) with three different cut points. **Methods:** We analyzed Wave 3 youth never user and young adult (age 18-24) past 12-month non-user data from the Population Assessment of Tobacco and Health study. We assessed how six methods of analyzing four Wave 3 intentions items (4-point response scale) predicted any past 12-month use at Wave 4. For each method, we assessed true positive and true negative rates (i.e., percentages of Wave 4 users and nonusers correctly identified) and logistic regression fit statistics for models using each method to predict use. **Results:** Results were similar across product types and age groups. Susceptibility scoring had the highest true positive rate but also lowest true negative rate; thus, the most Wave 4 users were correctly identified, but the fewest nonusers were correctly identified. False positives (identified as users but were actually nonusers) were best minimized by averaging items and using a cutoff of 3, or using the single item and a cutoff of 3 or 4. Averaging items best predicted use in regression models. **Conclusion:** Findings have implications for how researchers analyze tobacco use intention data. Findings suggest: (1) researchers seeking to predict tobacco use in regression models should average items together rather than use any scoring method; and (2) researchers seeking to identify which youth or young adults are likely to initiate tobacco should use different methods, depending on whether they are trying to maximize true positives or minimize false positives.

FUNDING: Federal

PS2-101**DUAL MARIJUANA PLUS TOBACCO USER CHARACTERISTICS AND BELIEFS COMPARED TO TOBACCO ONLY USERS IN AN URBAN LOW-INCOME MINORITY POPULATION OF FEMALE TOBACCO SMOKERS**

Samantha Davis, Bradley Collins, Stephen Lepore, Alison Hunt-Johnson, Melissa Godfrey. Temple University, Philadelphia, PA, USA.

Significance. Marijuana (MJ) use is on the rise in the U.S., as is dual MJ plus tobacco use. Improving public health professionals' understanding of tobacco smokers MJ beliefs, characteristics, and use patterns will inform theory and guide intervention design. **Methods.** This study represents a secondary analysis of self-report, cross-sectional data from low-income, female smokers enrolled in an ongoing smoking cessation trial. Participants were recruited from Philadelphia, Pennsylvania's Women, Infant and Children (WIC) clinics. Participants (N=396) were mostly (70%) African American, average age was 30 years old, ~61% had a high school degree/GED or less and on average smoked ~9 cigarettes/day. Independent sample T-tests examined group differences. **Results.** At baseline, 37% of participants reported MJ use at least once in the last 7 days, defined as dual tobacco plus marijuana group (T+MJ) versus tobacco-only users (T-only). Compared to T-only, T+MJ users were significantly younger ($p < .001$), had a lower BMI ($p = .03$), consumed alcohol more frequently ($p = .003$), had less clean homes (staff reported, $p = .008$), and reported higher beliefs that MJ was safe and not harmful (p 's $< .001$). No between-groups differences were found for other health behaviors, such as fruit and vegetable consumption, physical activity, and number of cigarettes per day. Similarly, no between-groups differences were found for chronic physical conditions, number of other smokers in the household, readiness to quit tobacco, and beliefs about nicotine replacement therapy helpfulness in quitting tobacco (all p 's $> .05$). **Conclusions.** Many factors, such as beliefs about MJ safety, are related to MJ use. The data indicates there may be some differential challenges to quitting tobacco in this sample. For instance, higher depression or increased alcohol use in T+MJ users may present additional cessation challenges. Additionally, MJ expectancies and MJ storage practices, as well as, implications of the overall findings will be discussed.

FUNDING: Federal

PS2-102**SBIRT TRAINING - A FOCUS ON THE DENTAL HYGIENE CURRICULUM**

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Screening, brief intervention and referral to treatment (SBIRT) is a US Public Health approach to early intervention and treatment for individuals with varying levels of substance abuse to include alcohol, tobacco, prescription medication and illicit drugs (ATOD). The University Of Cincinnati School Of Social Work received a three year federally funded grant from Substance Abuse Mental Health Services Administration (SAMHSA) to develop and provide training for both students and professionals in SBIRT. First and second year dental hygiene students (N=43) consented to be in the study to evaluate the training on SBIRT. Five measures were used to assess students knowledge (pre- and post-test) and satisfaction (baseline and 30 day follow-up) and a twelve month survey to learn if students added SBIRT practices into their professional practice. Descriptive statistics and pre and post paired t-tests were used to assess data. Results indicated dental hygiene students content knowledge with SBIRT and attitudes toward assessing patients with substance abuse improved based on pre and post test data. Furthermore, 91% of the students agreed or strongly agreed that SBIRT training was relevant to their career and 89% would recommend this training to colleagues.

FUNDING: Federal; State

PS2-103**FACTOR ANALYSIS OF A NOVEL 12-ITEM SMOKING URGE COPING SCALE IN A SAMPLE FROM THE KIDS SAFE AND SMOKEFREE (KISS) TRIAL**

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Significance: smoking relapse has been associated with an inability to resist urges to smoke. Smokers may employ diverse strategies to decrease relapse risk and level of urge to smoke. However, few validated measures of urge coping skills in active smokers are widely applied. **Purpose:** to investigate the factor structure of the 12-item Tobacco Urge Coping Scale (TUM-12) in a sample of participants from the KiSS trial. **Methods:** participants included parents recruited through pediatric clinics (n=327), who received 1 of 2 active treatments to promote smoking reduction around children and smoking cessation. Eligible participants were 18-65 and reported daily smoking patterns, reflecting variability in coping skills. Self-reported data collected through phone interviews at end-of-treatment (3 months from baseline) was included. TUM-12 includes a range of strategies, such as behavioral and cognitive skills, using a 4 Likert-type response scale (1=never, 2=rarely, 3=sometimes, 4=often) and 7-day recall period. Analysis of the factor structure used the maximum likelihood method in SPSS 25. **Results:** participants were primarily Black (84%), female (83%), single (59%), had a HS diploma/GED (40%) and annual income below the poverty line (79%). Mean frequency of coping strategies used was 2.59/12, which was normally distributed ($\mu=2.59$, $SD=0.715$). A 1-factor extraction met the Kaiser and scree plot criteria. TUM-12 had high internal consistency ($\alpha=0.87$). Factor loadings for a unidimensional construct ranged from 0.494-0.681 ($X^2(54) = 145.94$, $p<0.001$). The unidimensional construct is validated by significant differences in participants using coping strategies between the control and intervention groups, respectively ($\mu=29.07$, $SD=9.75$; $\mu=33.30$, $SD=6.44$, $p<0.001$). **Conclusion:** our results suggest TUM-12 is a reliable, unidimensional measure of smoking urge coping skills in a sample of adult smokers. Future research should further validate TUM-12 across additional populations of smokers.

FUNDING: Academic Institution

PS2-104

ASSOCIATION BETWEEN E-CIGARETTE AND CIGARETTE USE AMONG U.S. MIDDLE SCHOOL AND HIGH SCHOOL STUDENTS IN THE NATIONAL YOUTH TOBACCO SURVEY: 2004-2018

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Significance: E-cigarette use among U.S. youth has increased rapidly in recent years. The purpose of this study is to determine the effect of e-cigarette use on cigarette smoking among U.S. youth, and to determine if e-cigarettes attract youth who would be at low risk of smoking cigarettes based on known psychosocial predictors. **Methods:** Data came from the National Youth Tobacco Survey (NYTS), a stratified, three-stage cluster sampling procedure to produce a nationally-representative sample of U.S. middle and high school students (grades 6-12) attending private and public schools. An interrupted time series analysis was used for cross-sectional data from the 2004 to 2018 (2004, 2006, 2009, and annually from 2011-2018) surveys. The study assessed changes in cigarette and e-cigarette use after 2011, and compared predicted and actual cigarette smoking behaviors based on psychosocial predictors derived from multivariable logistic regression models. **Results:** The rate of decline in current cigarette smoking, which had been declining since 2004, began to slow in 2014 (-0.75 to -0.26 percentage points per year, $p<0.001$). However, the decline in ever cigarette smoking accelerated in 2012 (-1.45 to -1.71 per year, $p=0.015$). Ever ($p=0.038$) and current ($p=0.001$) use of cigarettes and/or e-cigarettes increased significantly during 2012-2013. During 2013-2018, there was no significant change in ever ($p=0.415$) or current ($p=0.112$) use of cigarettes and/or e-cigarettes. Current exclusive e-cigarette users did not share the psychosocial predictors of current cigarette smokers, suggesting that these youth may have been unlikely to smoke cigarettes. **Conclusion:** A slowing in the historical declining trend in current U.S. youth cigarette smoking occurred around the time that e-cigarettes became popular among US youth. Exclusive e-cigarette users were likely at low risk of smoking cigarettes, resulting in an overall observed increase in use of cigarettes and/or e-cigarettes among youth during 2011-2018.

FUNDING: Unfunded; Federal

PS2-105

TRENDS IN TOBACCO PRODUCT USE AMONG US YOUNG ADULTS, NATIONAL HEALTH INTERVIEW SURVEY, 2015-2018

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Significance: Few studies have examined trends in young adult (YA) tobacco product use, the age group when people can first legally purchase tobacco products in the US. This study examined recent trends in tobacco product use among U.S. YA (18-24 years). **Methods:** Data came from the 2015-2018 National Health Interview Survey, an annual, cross-sectional, nationally representative, household survey of U.S. adults 18 years and older. Tobacco products assessed were cigarettes, smokeless tobacco (SLT), cigars, pipes/water pipe/hookah, and e-cigarettes. Current use was defined as use "every day" or "some days"; cigarette smokers also reported lifetime smoking of at least 100 cigarettes. Use was assessed overall and by sex and race/ethnicity. Trends were assessed for: individual product use; any combustible smoking; single product use; multiple product use; and any tobacco product use. Logistic regression was used to assess linear and quadratic (non-linear) trends. **Results:** In 2018, 17.1% of YA reported any tobacco product use, with cigarettes (7.8%) and e-cigarettes (7.6%) being most common. During 2015-2018, there were linear declines for: any tobacco product use, cigarettes, pipes, any combustibles, and single product use ($p<0.05$). Non-linear changes occurred for e-cigarettes and SLT ($p<0.05$). Among both sexes, cigarette smoking and combustible smoking declined ($p<0.05$). E-cigarette use increased for females ($p<0.05$). For males, multiple product use increased ($p<0.05$); non-linear changes occurred for SLT, e-cigarettes, and pipes; and any tobacco product use declined ($p<0.05$). For all race/ethnicities, any combustible smoking decreased ($p<0.05$). For non-Hispanic (NH) blacks, single product and any tobacco product use declined ($p<0.05$). For Hispanics and NH whites, cigarette smoking decreased ($p<0.05$). For NH whites, SLT and pipe use declined; a non-linear change occurred for e-cigarettes ($p<0.05$). **Conclusion:** Tobacco product use has recently declined among YA. However, 1 in 6 currently use tobacco products, and variation in trends and use exist across products and demographics. Continued surveillance of tobacco product use among YA is critical to inform tobacco control efforts.

FUNDING: Unfunded

PS2-106

PERCEPTIONS OF PEER E-CIGARETTE USE AND SUSCEPTIBILITY TO E-CIGARETTE USE AMONG YOUTH IN CALIFORNIA

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Significance: The US is confronting an epidemic of youth e-cigarette use. In California, e-cigarette use among high school students increased 27% between 2016 and 2018. Peer behavior has a demonstrated effect on youth substance use. At the same time, there is evidence that youth may overestimate their peers' substance use behavior, which may increase individual susceptibility and curiosity towards substances like tobacco. **Materials and Methods:** Data are from the 2018 California Student Tobacco Survey (N= 151,404). We analyzed self-reported past 30-day e-cigarette exposure on school campus among 8th, 10th, and 12th graders, self-reported e-cigarette use on school campus, and susceptibility to e-cigarette use among never tobacco users. Proc Surveylogistic in SAS 9.4 was used. **Results:** The proportion of high school students reporting seeing e-cigarette use on school grounds in the past 30 days was 35.0% (95% CI= 32.6, 37.3). Among middle school students, 16.7% (95% CI= 13.4, 19.9) reported seeing e-cigarette use on school grounds. The proportion of youth who reported that they themselves used an e-cigarette on campus in the past 30 days was 3.3% (95% CI= 2.9, 3.7) for high school students and 1.2% (95% CI= 0.8, 1.6) for middle school students. Among youth who were never tobacco users and who reported having no friends who used e-cigarettes (n=61,055), the adjusted odds ratio for susceptibility to e-cigarette use based on self-report of seeing e-cigarette use on school campus in the past 30 days was 1.47 (95% CI= 1.26 - 1.70) for high school students and 1.71 (95% CI= 1.20 - 2.43) for middle school students. **Conclusions:** Exposure to peer e-cigarette use on school grounds appears to significantly influence susceptibility to e-cigarette use among youth who are never tobacco users, even when only a small proportion of students report using e-cigarettes on campus.

FUNDING: Unfunded



PS2-107

REACH AND EFFECTIVENESS OF TOBACCO DEPENDENCE TREATMENT PROGRAMS IMPLEMENTED AT NCI-DESIGNATED CANCER CENTERS IN THE CANCER CENTER CESSATION INITIATIVE

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Significance Smoking cessation services are often not available or offered in oncology settings, despite known benefits for cancer outcomes. Through the Cancer Center Cessation Initiative (C3I), the National Cancer Institute (NCI) dedicated Cancer Moonshot funding to NCI-Designated Cancer Centers to increase the reach of tobacco dependence treatment programs. Utilizing common metrics, we report on the reach and effectiveness of C3I-funded programs implemented in real-world oncology settings. Methods Cancer Centers funded in the first Cohort of C3I reported on current smoking prevalence, tobacco use screening rates, reach, and effectiveness for July-Dec 2018 (12-18 months post-funding). Reach (percent of adult smokers receiving counseling, cessation medications, or referrals to a quitline, text, or web program) was calculated for 18 Centers/affiliated settings with complete data (of total n = 22). Thirty-day point prevalence smoking abstinence at 6-months post-engagement was measured among program participants at 12 Centers/affiliated settings. Results Between 45.7% and 100.0% (median 95.5%) of adult patients were screened for tobacco use over six months. Average current smoking prevalence was 11.3% (range 4.5% to 22.0%). Across all settings, 4,333 smokers were reached with at least one type of tobacco dependence treatment. Reach varied by setting, ranging from 3.4% to 87.3% (median=17.1%). In-person counseling reached 11.4% of smokers on average, while an average of 2% of smokers were referred to the quitline. On average, 14.0% of smokers received/were prescribed cessation medication. Average 30-day abstinence rates applying intent-to-treat were 11.6% (median=7.6%). Conclusion Implementing tobacco dependence treatment programs in oncology settings can reach large numbers of cancer patients who smoke, and may lead to improved cessation and treatment outcomes. Smokers at these Centers were reached most often by internal counseling programs; fewer were referred to external resources. Strategies for optimal use of internal and external treatment resources will be discussed.

FUNDING: Federal

PS2-108

"I HAVE HEALERS IN MY BLOOD": CIGARETTE SMOKING AMONG AMERICAN INDIAN WOMEN EXPERIENCING INTIMATE PARTNER VIOLENCE

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Significance: Indigenous culture, traditional teachings and knowledge are essential in a culturally relevant smoking cessation intervention for American Indian women experiencing Intimate Partner Violence (IPV). American Indian women, including Lakota women, experience IPV 30% more than any other racial group. Further, smoking prevalence has increased over the past two decades, from 34.1% to 40.9% among American Indian Women. Methods: Through the NIH Native American Research Centers for Health (NARCH), "Cigarette Smoking Among American Indian Women Experiencing Intimate Partner Violence (IPV)" researchers from the Black Hills Center for American Indian Health (BHCAI) and the Center for Health Equity Research at Northern Arizona University engaged qualitative research methods to inform the development of a culturally and trauma informed smoking cessation intervention for American Indian women experiencing IPV. Guided by a Community Advisory Board (CAB), researchers conducted a series of key informant interviews (N=15) with IPV behavioral health and community service providers and focus groups (N=8) with American Indian IPV survivors which included former smokers (n=24) and current smokers (n=20). Through collaborative analysis, researchers and CAB members analyzed responses to inform intervention. Themes included barriers and promoters to quit smoking, cultural values, teachings and knowledge, and modalities of intervention. Presentation will describe how qualitative research informed the development and delivery of the cessation intervention. Results/Outcomes: Results describe Lakota cultural values, teachings and traditional medicine fundamental to develop a trauma informed cessation intervention. Participants identified traditional practices promotive of cessation, including smudging and sweats, and story-

telling. Intergenerational mentorship was believed to support behavior change, as was critical history of the use of commercial tobacco in Lakota communities. Conclusions: To date there have been no smoking cessation intervention for American Indian Women experiencing IPV. Understanding experiences of trauma related to IPV, Lakota values, teachings and healing practices is vital in the design of a culturally relevant and trauma informed smoking cessation intervention.

FUNDING: Federal

PS2-109

SMALL-AREA PREVALENCE OF SMOKING DURING PREGNANCY PREDICTS THE RISK OF SMOKING DURING PREGNANCY

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Significance: It is important to understand the interplay between individual- and neighborhood-level factors, and potential racial/ethnic differences, to improve interventions for cessation of cigarette smoking during pregnancy (SDP). Methods: Births to nulliparous women in 2010-2016, from Missouri birth records, were linked via census tract to 2012-2016 American Community Survey data. Individual-level sociodemographic factors: Maternal variables (e.g. age, education, marital status, BMI) from birth records were used to develop a sociodemographic propensity risk score for white non-Hispanics (WNH; N=123,914) and African Americans (AA; N=24,613) separately. Neighborhood-level risk indices include: 1) census tract five-year aggregate SDP rates, for the five years preceding childbirth, from birth records 2005-2015 (ctSDP); 2) American Community Survey variables, selected under Family Capital framework, aggregated to census tract. Factor analysis identified a two-factor solution: F1, socioeconomic disadvantage and F2, population density/family instability. Using multilevel logistic regressions, we evaluated the contribution of neighborhood-level risk indices to SDP risk, beyond individual-level sociodemographics, separately by maternal race/ethnicity. Results: SDP prevalence was 13% (WNH) and 6.9% (AA). Compared to the highest decile of ctSDP, the lowest decile of ctSDP reduced risk for SDP (WNH: OR=0.54, 95% CI: 0.47, 0.62; AA: OR=0.38, 95% CI: 0.26, 0.55). Compared to the F2 highest population density decile, the most rural quantile increased risk for SDP (WNH, decile: OR=1.26, 95% CI: 1.10, 1.43; AA, quintile: OR=2.48, 95% CI: 1.53, 4.02). Compared to the F1 highest disadvantage decile, the least disadvantaged decile reduced risk for SDP for WNH (OR=0.53, 95% CI: 0.44, 0.63), but the association was not significant for AA. Conclusions: Established sociodemographic predictors of SDP apply to white non-Hispanic women, but less so for African American women. Neighborhood-level risk indices, particularly census tract SDP rate, predict risk for SDP beyond individual-level sociodemographics, and these relationships differ by maternal race. These previously poorly understood environmental factors may contribute, at least in part, to the poor performance of smoking cessation interventions in pregnancy to date.

FUNDING: Federal

PS2-111

TRAJECTORIES OF PERCEIVED HARM AND THEIR RELATIONSHIPS TO E-CIGARETTE, CIGARETTE, AND OTHER NICOTINE/TOBACCO USE AMONG U.S. YOUTH

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Significance: To address the dearth of research on perceived harm of e-cigarettes, this study examined latent profile trajectories characterizing harm perceptions and their association with use of e-cigarettes, cigarettes, and other nicotine/tobacco products in a sample of 12 to 17-year-olds (n = 7595). Methods: Three waves of data (2013-2016) from the national Population Assessment of Tobacco and Health (PATH) Study were used. Analysis was restricted to youth who completed all three waves. Self-report measures of perceived harm of e-cigarette, cigarette, and other nicotine/tobacco use were assessed (4 = "a lot of harm" to 1 = "no harm") using latent profile analysis to identify unique trajectories. All forms of nicotine/tobacco use were determined for past 30-day use. Results: Five latent profile trajectories emerged. Overall, youth viewed cigarette use as most harmful (Mean = 3.80, SD = .353), followed by other tobacco use (Mean = 3.51, SD = .478), and e-cigarette use (Mean = 3.09, SD = .679). Youth who were identified as having a decrease in harm perceptions had higher rates of past-year e-cigarette use, cigarette use, and other tobacco use during the study period (with differences being most prominent at Wave 3). However, only 2.8% of adolescents were in



the trajectory characterized by decreasing harm perceptions; the largest trajectory group consistently perceived e-cigarette, cigarette, and other tobacco use as harmful (48.4%). Notably, the lower harm perceptions of e-cigarette use across the five profiled groups corresponded to higher rates of past-year e-cigarette use when compared to past-year cigarette and other tobacco use. **Conclusion:** Youth generally perceive harm in all forms of nicotine/tobacco use and increased and stable harm perceptions were associated with less e-cigarette, cigarette, and other nicotine/tobacco use. However, even when harm was recognized, often a nicotine/tobacco product was used. Understanding the different profiles and their relationship to nicotine/tobacco use will help public health experts tailor their educational messages and more precisely determine appropriate secondary prevention for at-harm youth.

FUNDING: Federal

PS2-112

IMPACT OF ADOLESCENTS' E-CIGARETTE AND OTHER NICOTINE/TOBACCO USE ON CHANGES IN PHYSICAL ACTIVITY

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Significance: E-cigarette use among U.S. adolescents has been increasing, yet very few studies assess how e-cigarette use may influence physical activity within this population. The purpose of this study was to examine the influence of e-cigarette and other types of nicotine/tobacco use on physical activity within a longitudinal sample of adolescents. **Methods:** The present study used the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative database of youth (ages 12 to 17) who were assessed at three separate time points about one year apart. The analysis was restricted to youth who completed Waves 1, 2, and 3. Self-report measures of past 30-day e-cigarette use/frequency and other types of nicotine/tobacco use, and 7-day frequency of moderate-to-vigorous physical activity were the primary variables. **Results:** Overall, adolescents who engaged in any past 30-day cigarette use engaged in fewer days of physical activity (Mean = 3.66, SE = .126) when compared to adolescents who did not engage in past 30-day cigarette use during the study period (Mean = 4.07, SE = .027). Number of days of physical activity were similar between adolescents who engaged in past 30-day e-cigarette use (Mean = 3.91, SE = .108) versus adolescents who did not engage in e-cigarette use during the study period (Mean = 4.06, SE = .029). Past 30-day e-cigarette, cigarette, and other nicotine/tobacco use/frequency at baseline were not associated with decreases in physical activity during the study period. **Conclusion:** While current e-cigarette, cigarette, and other tobacco use did not account for any changes in physical activity, adolescents who engaged in cigarette use engaged in fewer days of physical activity when compared to their peers who did not smoke cigarettes. Moreover, e-cigarette use did not account for any of the variation in the number of days that adolescents engaged in either moderate or vigorous forms of physical activity. Accordingly, it is imperative to intervene during adolescence to limit both e-cigarette and other types of tobacco use before it may negatively influence involvement in physical activity.

FUNDING: Federal

PS2-113

HEALTHY DISAGREEMENT AS A DRIVER FOR HEALTH PROMOTION DIALOGUE - PUBLIC RESPONSE TO AN AUTOMATED HEALTH COMMUNICATION INTERVENTION ACROSS MULTIPLE SOCIAL MEDIA PLATFORMS

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Significance: Previous research suggests that social media public health campaigns are often targeted by counter-campaigns. Using reactance theory as the theoretical framework, this research characterizes the nature of public response to tobacco prevention messages disseminated via an automated social media campaign. We also examine whether disagreement with the prevention messages is associated with a negative comment tone and toxic nature of the contribution to the overall discussion. **Methods:** User comments to automated tobacco prevention messages were extracted from Twitter (n=1004), Facebook (n=176), and Instagram (n=62). Two coders categorized comments in terms of: (i) Tone of the comment (positive, negative, neutral), (ii) Nature of contribution (toxic contribution, healthy contribution, defined as non-toxic language); and (iii) Agreement with prevention message (agree, disagree, seek clarification or

advice), (iv) Mentions of government agency (yes, no), (v) Stance toward regulation (pro-, anti-, neutral-regulation, not applicable), (vi) Promotion (yes, no), and (vii) Format (text only, Meme/Sticker/Emoji/Emotion only, both). Chi-square analyses tested associations between the tone of the public response and the nature of contributions to the discussions. **Results:** Of the 1,242 comments, many comments used a negative tone (42.75%) and disagreed with the health messages (39.77%), while the majority made healthy contributions to the discussions (84.38%). Only 0.56% of messages mentioned a government agency, and only 0.48% of the comments were anti-regulation. Comments employing a positive tone (84.13%) or making healthy contributions (69.11%) were more likely to agree with the campaign messages. Comments employing a negative tone (71.25%) or making toxic contributions (36.26%) generally disagreed with the messages. **Conclusion:** The majority of user comments to a tobacco prevention campaign made healthy contributions. However, toxicity was characteristic of comments that disagreed with the health messages. Managing negative and toxic comments on social media is a crucial issue for social media-based health campaigns to consider.

FUNDING: Federal

PS2-114

A SYSTEMATIC REVIEW OF RESEARCH ON JUUL AND POD-BASED E-CIGARETTES RELEVANT TO YOUTH AND YOUNG ADULT USE 2015-2019

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Significance: The use of pod-based e-cigarettes (pod e-cigs) such as JUUL, Suorin, Bo, and Pnix has rapidly increased among youth and young adults since their introduction in 2015. In this systematic review, we summarized current research evidence on pod e-cigs' design and biological effects, marketing, and use and perceptions among youth and young adults. **Methods:** We conducted a systematic search of online databases including PubMed, Web of Science, EMBASE, and EBSCO HOST for pod e-cigs-related articles from June 2015 (when JUUL was first introduced) to June 2019. We included English language articles that presented primary data on pod e-cigs. **Results:** A total of 39 articles were included in the review. Seven articles focused on JUUL and other brands of pod e-cigs while all others focused only on JUUL. Pod e-cigs deliver a high dose of nicotine in a form with low irritation that facilitates ease of use while promoting nicotine dependence. These products contained fewer harmful constituents, and at lower concentrations than cigarettes and other types of e-cigarettes but the effects of long-term exposure to these constituents among youth are unknown. Pod e-cigs targeted youth and young adults with social media marketing, and there was little discussion about use of these products as smoking cessation devices or their health risks on social media. Past 30-day use was 4%-6% among youth (15-17). Social acceptability and favorable perceptions of pod e-cigs contribute to their use among young people. There was limited awareness of pod e-cigs' nicotine content among youth. **Conclusions:** To prevent adolescent and young adult use of pod e-cigs, stronger regulations on social media, marketing channels, product design, and youth access are needed and health communications that emphasize the risks of nicotine dependence are needed. Future research should examine pod e-cig brands other than JUUL, determine how social media marketing and perceptions of pod e-cigs influence use among adolescents, conduct longitudinal studies on health risks of pod e-cig use, and understand parental knowledge and communication about pod e-cigs with their children.

FUNDING: Federal; Academic Institution

PS2-115

ASSESSING THE POPULATION HEALTH EFFECTS OF NEW TOBACCO AND RELATED PRODUCTS

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Introduction - Recently, many new tobacco and related products (TRP) have emerged on the market, with unknown risks at individual and population level. Here, we present an evaluation framework containing all factors and relations between them that contribute to the TRP's health effects. As an example, we evaluated the JUUL, a very popular e-cigarette. **Methods** - Factors that determine attractiveness, addictiveness and toxicity were defined based on reports about previous assessments, literature, and expert discussions, which resulted in a framework. Relevant publications on JUUL were retrieved from a PubMed search and were used to evaluate all factors. **Results** - Our framework can be used to identify aspects of a product that require specific



attention for public information or product regulation. In addition, it can gauge attractiveness for specific user groups, and exposure on population level. Aspects of concern identified for JUUL are its attractive and discrete shape, user-friendly prefilled pods, high aerosol nicotine levels, and liquids containing nicotine salts instead of free-based nicotine. **Conclusions** - Our framework will aid in identifying the key risk factors for a product. For example, the addictiveness and especially attractiveness of the JUUL are sufficiently high to have a large potential impact on population health, even if the amounts of toxicants in the emissions should be lower than for other e-cigarettes. As results can change over time due to changes in use and product modification, market research and monitoring is crucial. **Implications** - Our framework can be used for risk assessment of TRP. Since all factors presented contribute to their toxicity, attractiveness, and addictiveness, policy makers are advised to consider these factors as a possible target for future product regulation. In addition to the aspects of concern we identified for the JUUL, we advise to consider the many JUUL compatible pods, JUUL knock off devices, and e-liquid brands selling high-nicotine products. Given that the EU Tobacco Product Directive has set an upper limit for nicotine levels in e-liquids, the high-nicotine aspect may be less of a concern.

FUNDING: Federal

PS2-116

ALDEHYDE AND VOC LEVELS IN COMMERCIAL CIGARETTE MAINSTREAM SMOKE ARE MUTUALLY RELATED AND DEPEND ON THE SUGAR AND HUMECTANT CONTENT IN TOBACCO

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Introduction - The WHO Study Group on Tobacco Product Regulation proposed to regulate nine toxicants in mainstream cigarette smoke, including aldehydes, volatile organic compounds (VOCs) and carbon monoxide (CO). We analysed their relations in 50 commercially available cigarette brands, using two different smoking regimes, and their dependence on sugar and humectant levels in tobacco filler. **Methods** - Sugar and humectant levels in tobacco filler, and aldehydes, VOCs, and tar, nicotine and carbon monoxide (TNCO) in mainstream smoke were measured. The general statistics, correlations between emission levels, and correlations between contents and emissions levels were determined for these data. **Results** - For aldehydes, several significant correlations were found with precursor ingredients in unburnt tobacco when smoked with the Intense regime, most prominently for formaldehyde with sucrose, glucose, total sugars, and glycerol. For VOCs, 2,5-dimethylfuran significantly correlates with several sugars under both ISO and Intense smoking conditions. A correlation network visualization shows connectivity between a sugar cluster, an ISO cluster and an Intense cluster, with Intense-formaldehyde as a central highest connected hub. **Conclusions** - Our multivariate analysis showed several strong connections between the compounds determined. The toxicants proposed by WHO, in particular formaldehyde, can be used to monitor levels of other toxicants under Intense conditions. Emission levels of formaldehyde, acetaldehyde, acrolein, and 2,5-dimethylfuran may decrease when sugar and humectants content levels are lowered in tobacco filler. **Implications** - Our findings suggest that the aldehydes and VOCs proposed by ToBReg are a representative selection for market monitoring purposes. Since the most and strongest correlations were observed with the Intense regime, policy makers are advised to prescribe this regime for regulatory purposes. Policy makers should also consider sugars and humectants content levels as targets for future tobacco product regulations, with the additional advantage that consumer acceptance of cigarette smoke is proportional to their levels in the tobacco blend.

FUNDING: Other

PS2-117

IDENTIFICATION OF ANALYTICAL MARKERS TO DETECT AND AVOID OVERHEATING CONDITIONS ('DRY PUFF') IN THE ANALYTICAL ASSESSMENT OF E-CIGARETTE EMISSIONS.

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There are currently no well-established criteria for choosing a laboratory vaping protocol. Many models of e-cigarettes allow manual adjustment of the delivered power. At high power, or when the e-liquid reservoir is nearly empty, users risk overheating the heating element and e-liquid, resulting in what is known as a 'dry puff'. This is accompanied by an intensely adverse taste, and an increase in toxicants (most notably aldehydes), and

users learn to adjust their e-cigarette settings or refill the reservoir when this happens. When e-cigarette emissions are collected in the laboratory with an automated vaping machine, 'dry puffs' are likely to go unnoticed, which may result in a considerable overestimation of user exposure to toxicants, such as aldehydes. To address this issue, we set out to identify characteristic marker compounds in e-cigarette emissions that can be used to detect dry puffs with routine analytical chemical techniques. For this purpose, we invited a panel of experienced e-cigarette users to vape e-cigarettes at different power settings, and to report on the presence of the adverse flavor associated with overheating. We then repeated the same vaping sessions in the laboratory using an automated vaping machine, with the same e-cigarettes, and analyzed the emissions for components that could be correlated with the adverse flavor. We observed eight components that are characteristic for the overheated condition of e-cigarettes. These compounds are not detectable in the vapor at low power settings, and their concentrations increase with increasing e-cigarette power. They are observed independently of e-liquid flavor, nicotine concentration or the PG/VG ratio. By correlating the levels of these compounds with the presence of an adverse burnt taste as noted by the panel of volunteers, recommendations are made for determining the appropriate power setting for laboratory assessments of e-cigarette emissions. We suggest this may be used as a useful tool to determine the appropriate power setting for a given e-cigarette/e-liquid combination.

FUNDING: Other

PS2-118

THE CONTRIBUTION OF FLAVORING COMPOUNDS TO CARBONYLS IN E-CIGARETTE EMISSIONS.

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E-cigarettes are gaining in popularity among non-smokers, which is concerning in view of the health effects associated with the use of these devices. We and others have shown the presence of harmful levels of several compounds in the emissions of e-cigarettes, including carbonyls such as formaldehyde and acetaldehyde. A better understanding of the formation of these harmful compounds is important. Regulators may use that to better regulate the design or composition of devices and refill liquids. Laboratories may use it to improve their analytical methods. It is now well established that the thermal decomposition of propylene glycol and glycerol are at least one source of the carbonyls observed in e-cigarette emissions. However, it has also been reported that concentration of carbonyls in e-cigarette emissions depends on the flavor of e-liquid, in some cases quite dramatically. In this study, we aimed to study the contribution of flavor ingredients to the levels of carbonyls in e-cigarette emissions. For this purpose, we first screened 25 e-liquids with different flavors. To avoid 'dry puffs' in the analysis, vaping conditions (e-cigarette/coil, power settings) were established using a panel of experienced volunteers. For the e-liquids with the highest carbonyl emissions, the composition was investigated with GC-MS. The individual flavor ingredients were subsequently used to prepare e-liquids, and tested to establish their contribution to the carbonyl emissions. Given the very limited information currently available on the relationship between e-liquid composition, e-cigarette design and harmful emissions, our results are of particular interest to policy makers tasked with regulating e-liquid ingredients and e-cigarette design.

FUNDING: Federal

PS2-119

DIFFERENCES IN TOBACCO-RELATED ADVERTISEMENT EXPOSURE ONLINE AND IN THE BUILT ENVIRONMENT BETWEEN YOUTH EVER TOBACCO USERS AND NEVER USERS: PRELIMINARY ANALYSES FROM THE ADOLESCENTS, PLACE, AND BEHAVIOR STUDY

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Significance: Exposure to tobacco advertisements is associated with youth tobacco use. The extent to which frequency of exposure to tobacco advertisements across the built environment, the Internet, or social media is associated with youth tobacco use is unknown. **Methods:** Youth and parent data were obtained from the Adolescents, Place, and Behavior Study, an ongoing, prospective cohort study of diverse, urban youth aged 11 to 15 years residing within 50 miles of Richmond, Virginia (current N = 175). Self-reported frequency of tobacco advertisement exposure on the Internet, social



media platforms, and retail stores were assessed using Likert scales, ranging from 0 (never) to 4 (always). Frequency of tobacco advertisement exposure on social media was summed across: Snapchat, Instagram, YouTube, Facebook, Twitter, Reddit, and Tumblr. Multiple logistic regression models were conducted to examine associations between frequencies of exposure to tobacco advertising from each source and self-reported ever tobacco use. Covariates included race/ethnicity, age, gender, income, and level of financial comfort. **Results:** Mean frequency of tobacco advertisement exposure was higher among ever tobacco users, compared to never tobacco users for the Internet (2.08 and 1.53), social media (6.18 and 3.61) and retail stores (2.34 and 2.06, respectively). Unadjusted models showed that endorsement of ever tobacco product use was significantly associated with greater frequency of tobacco advertisement exposure on social media (unadjusted OR = 1.16; 95%CI: 1.04, 1.30), but was not associated with frequency of tobacco advertisement exposure on the Internet (unadjusted OR = 1.16; 95% CI: 0.81, 1.67) or in retail stores (unadjusted OR = 1.16; 95%CI: 0.81, 1.67). After controlling for covariates, these associations remained, with frequency of tobacco advertisement exposure on social media having an increasing association with youth tobacco use (adjusted OR = 1.22; 95% CI: 1.07, 1.39), but not with frequency of exposure to tobacco advertisements on the Internet (adjusted OR=1.04; 95% CI: 0.68, 1.60) or retail stores (adjusted OR = 0.91; 95% CI: 0.58, 1.42). **Conclusions:** Although retail environments and the Internet continue to advertise tobacco, only tobacco advertisements via social media was associated with youth tobacco use. Research examining how tobacco advertisements on specific social media platforms contribute to tobacco product use may be warranted. Regulatory controls over tobacco advertisements on social media may help to reduce youth tobacco use.

FUNDING: Nonprofit grant funding entity

PS2-120

ASSOCIATION BETWEEN ELECTRONIC CIGARETTE USE AND TOBACCO-ASSOCIATED CANCER MORBIDITY AMONG ADULTS IN THE UNITED STATES

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Significance: E-cigarettes deliver lower levels of many carcinogens than combusted tobacco products. Despite exposing users to lower levels of carcinogens, e-cigarettes may still increase the risk of tobacco-associated cancer. This study assess the association between e-cigarette use and cancer adjusting for combustible tobacco use. **Methods:** Cross-sectional and longitudinal analysis of the adult Population Assessment of Tobacco and Health survey Waves 1-4 was used. Multivariable logistic regression was performed to determine the associations between e-cigarette use and cancer, adjusting for combustible tobacco smoking, and demographic variables. **Results:** Cross-sectional analysis of Wave 1 revealed statistically significant associations between current e-cigarette use (adjusted odds ratio 1.46, 95% CI: 1.05, 2.03) and current combustible tobacco use (2.19, 95% CI: 1.36, 3.51) and tobacco-associated cancer. The effects of e-cigarettes and combustible tobacco were independent, suggesting that dual use is riskier than using either product alone. Among people who did not report cancer at Wave 1 there were not statistically significant associations between e-cigarette or combustible tobacco use and incident cancer at Waves 2-4. Tobacco-associated cancer at Wave 1 did not predict e-cigarette use at Waves 2 or 3 or 4, suggesting that reverse causality cannot explain the cross-sectional association between e-cigarette use and tobacco associated cancer at Wave 1. **Conclusions:** Current e-cigarette use is associated with tobacco-associated cancer. Dual use of e-cigarettes and combustible tobacco is riskier than using either product alone.

FUNDING: Federal

PS2-121

HOUSING TYPE AND SECONDHAND TOBACCO SMOKE AMONG ADULTS IN NYC OVER TIME

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Background: Secondhand smoke (SHS) exposure has declined over time due to reductions in smoking and expansion of workplace and public smoke-free air laws, as well as smoke-free housing. Population-based studies have documented decreases in biomarkers of SHS exposure, such as cotinine, among non-smoking adults. However, SHS remains a health concern in densely populated settings. A higher proportion of non-smoking adults have elevated cotinine in New York City (NYC) (37%) than nation-

ally (24%), despite a lower NYC smoking prevalence. Multiunit housing (MUH) density may explain elevated cotinine among NYC non-smoking adults, but direct associations between residential housing type and cotinine have not been examined among NYC adults. **Methods:** We used 2004 and 2013/14 NYC Health and Nutrition Examination Survey data to examine associations between living in MUH (single-family homes versus 2; 3-99; and 100+ units) and having elevated cotinine among 1324 adult who do not smoke in 2004 and 946 in 2013/14, adjusting for socio-demographics (gender, age, race/ethnicity, education, income) and additional SHS exposure variables, overall and for individual years. Pooled and single-year adjusted multivariable regressions were conducted. Elevated cotinine was defined as a serum level of ≥ 0.05 ng/ml. **Results:** In the adjusted multivariable regression model combining data from both years, there was no difference in likelihood of having elevated cotinine by housing type. Having elevated cotinine was less likely in 2013/14 than 2004 (Odds Ratio= 0.40 (95% confidence interval, 0.32, 0.50)). Examining data within survey years, elevated cotinine did not vary by housing type in 2004, while elevated cotinine was twice as likely among MUH residents compared to single family residents in 2013/14 (OR = 2.67 (1.14, 6.25) for 3-99 units vs 1 units). **Conclusions:** While smoke-free restrictions have increased and exposure to SHS has declined, the contributing influence of residing in MUH on SHS exposure is only observed in 2013/2014. Policies and programmatic interventions targeting housing-related SHS exposures may play critical roles in reducing SHS exposure in urban settings.

FUNDING: Unfunded

PS2-122

OBSERVANCE OF E-CIGARETTE USE IN SCHOOLS AMONG U.S. MIDDLE AND HIGH SCHOOL STUDENTS - NATIONAL YOUTH TOBACCO SURVEY, 2019

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Significance: E-cigarettes are the most commonly used tobacco product among U.S. youth. Media reports suggest youth are using e-cigarettes in schools, but no study has quantified the extent of this behavior. This study assesses students' observance of e-cigarette use in or around their school among a nationally-representative sample of U.S. middle and high school students. **Methods:** Data came from the 2019 National Youth Tobacco Survey (NYTS), an annual, cross-sectional survey of U.S. students attending public and private schools in grades 6-12; the NYTS was administered electronically for the first time in 2019. Students were asked, "Have you ever seen anyone using an e-cigarette, such as JUUL, Vuse, MarkTen, or blu in any locations in or around your school?" Respondents could select one or more locations: a bathroom or locker room; a classroom; some other indoor area (hallway, cafeteria); outside of the school (parking lot, sidewalk, or other area); somewhere else; or answer with "no". Weighted prevalence estimates with 95% confidence intervals (CI) of ever seeing any e-cigarette use, and use in each specified location, were assessed overall and by school level, sex, race/ethnicity, and tobacco product use status; population totals were estimated from extrapolated probability weights. **Results:** Overall, 63.9% (95% CI: 62.0-65.9), or about 16.8 million students reported ever seeing e-cigarettes used in one or more locations, including 52.0% of middle school and 73.4% of high school students. Among these students, 53.2% reported seeing e-cigarette use in a bathroom or locker room (9.0 million), 52.2% outside on school grounds (8.9 million), 34.4% in a classroom (5.8 million), 31.7% in some other indoor area (hallway, cafeteria; 5.3 million), and 45.5% in some other unspecified area (7.7 million). **Conclusion:** In 2019, about two-thirds of U.S. middle and high school students reported ever seeing someone use an e-cigarette in or around their school. Efforts are warranted to prevent youth access to, and use of e-cigarettes, including on school grounds.

FUNDING: Federal

PS2-123

SYSTEMATIC REVIEW ON OUTCOMES OF TRANSDERMAL NICOTINE PATCHES AIDING SMOKING CESSATION AMONG SCHIZOPHRENIC PATIENTS

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Back ground: Literature review shows patient with schizophrenia have higher rates of smoking than in general population and are more refractory to smoking cessation. In addition schizophrenic patients smoke more heavily and extract more from each cigarette. Previous literature evidence have stated that effect of transdermal nicotine patches and usage of Nicotine replacement therapy in conjugation with the pharmacotherapy



has a better rate of smoking cessation and reducing dependence among this population. To have a better understanding on which among these would be an appropriate therapeutic measures in smoking cessation and reducing nicotine dependence among this population, we systematically analyzed the available literature as it would form the highest level of evidence. **Methods:** The review included studies from 2007-2017. Only placebo controlled, Randomized control trials involving human population were considered. The titles and abstracts were independently screened by two authors and identified by the search and decided on the possible reports to be included. We obtained and examined full text reports of all potentially relevant trials, to decide whether the studies fulfilled the inclusion criteria. **Results:** Twenty relevant articles were identified (Pubmed=12, Google scholar=7 Trip database=1). Thirteen articles were eliminated after reading the title. One article was eliminated due to duplication. Six articles were selected for the abstract reading. After the abstract reading, one article was included and three were excluded. Four studies which met the inclusion criteria were taken for the present systematic review. Based on the study findings, it could be stated that the combination of Transdermal nicotine patches and sustained release of bupropion (BUP) was well tolerated, and superior to Transdermal nicotine patches and placebo for short term smoking cessation in schizophrenic patients. **Conclusion:** This systematic review highlights the importance of combination of transdermal nicotine patches and Bupropion in increasing smoking abstinence rates among smokers with schizophrenia.

PS2-124

CHRISTINA WYSOTA

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Significance: Studies have found that sleep disturbances are often associated with unhealthy behaviors, such as tobacco use. Nicotine found in cigarettes has been shown to increase sleep latency and reduce total amount of sleep. Sleep has also been associated with several negative health outcomes such as diabetes, hypertension, obesity, and depression. Despite these findings, there is little research on the impact electronic cigarette smoking has on sleep. The objective of this study was to identify rates and sociodemographic correlates of fatigue and sleep problems among PATH study participants. **Methods:** We used baseline survey data from Adult Wave 1 of the Population Assessment of Tobacco and Health (PATH) Study (n=32,317). Fatigue in the past seven days was dichotomized into none/mild/moderate versus severe/very severe and significant sleep problems were dichotomized into never/over a year ago versus within the past 12 months. We used weighted bivariable and multivariable logistic regression to identify participant factors associated with fatigue and sleep problems. **Results:** In the fully adjusted weighted multivariable logistic model, compared non-tobacco users, cigarette users had 2.34 greater odds of reporting severe or very severe fatigue in the past seven days and e-cigarette users had nearly three times greater odds, independent of sex, age, race, and education (AOR = 2.34, 95% CI: 1.90-2.87 and AOR = 2.82, 95% CI: 2.18-3.64). Furthermore, cigarette users and e-cigarette users were significantly more likely to report sleep problems in the past year compared to non-tobacco users, after controlling for socio-demographic variables (AOR = 2.11, 95% CI: 1.91-2.32 and AOR = 2.51, 95% CI: 2.19-2.88). **Conclusions:** After controlling for sociodemographic factors, tobacco users were significantly more likely to report fatigue and sleep problems compared to non-tobacco users. Future research is needed to identify mechanisms through which e-cigarettes effect users sleep. This research is limited to self-report and cross-section design. Temporality cannot be established such that e-cigarette effects may be attributed to a history of smoking rather than e-cigarette use.

PS2-125

THE RISK OF GALLBLADDER CANCER AMONG SMOKELESS AND COMBUSTIBLE TOBACCO USERS IN INDIA

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Significance: Across all biliary tract malignancies, gallbladder cancer (GBC) is the most common. Globally, women are at a higher risk of developing GBC compared to men. Few studies have explored the risk of combustible tobacco use on GBC, and none have explored the influence of smokeless tobacco. We present novel data on the risk of combustible and smokeless tobacco use on GBC in India. **Methods:** A countrywide hospital-based case control study of GBC was conducted in India from 2010 to 2015. A total of 1,169 GBC cases and 2,524 controls were enrolled in the study. Unconditional logistic regressions assessed the risk of GBC for five categories of tobacco products controlling for age, education, geographic area, gender, history of gallstones and waist-

to-hip ratio. Since alcohol use is not strongly related to GBC it was not controlled for in the analysis. For all regressions, the reference category was non-tobacco users. Risk of GBC was assessed for men and women together and separately. Separate regressions were run stratified by duration of tobacco use in years. **Results:** The risk of tobacco use in any form increased the risk of GBC. However, the risk was stronger and statistically significant among females. Compared to non-tobacco users, the risk of GBC was four times higher among female bidi smokers (OR= 4.42; 95% CI= 1.14-17.11) and two times higher among women using smokeless tobacco with Pan, Lime, Areca nut and/or Catechu (OR=2.02; 95% CI= 1.25-3.28). This relationship held among women who used any form of tobacco (OR=1.63; 95% CI= 1.17- 2.27), smokeless tobacco exclusively (OR=1.62; 95% CI= 1.15-2.28) and smokeless tobacco without pan (OR=1.52; 95% CI= 1.06-2.17). We observed no relationship between tobacco use and risk of GBC among men. **Conclusion:** Our findings have important implications for the risk of gallbladder cancer among female tobacco users and highlight the need for further research to understand the biological mechanisms for informing gender specific prevention strategies including tobacco cessation among this priority population. **Support:** Tata Memorial Centre, Mumbai India, Department of Biotechnology. Analysis was conducted at Centre for Cancer Epidemiology, in Mumbai, India with fellowship funding support from Brown University Population Studies Training Center (PSTC) and Brown University School of Public Health, USA.

FUNDING: Academic Institution; Other

PS2-126

POLYTOBACCO USE PROFILE MAY BE MOST HARMFUL FOR NON-HISPANIC BLACK POLYUSERS - FINDINGS FROM THE NATIONAL HEALTH INTERVIEW SURVEY

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SIGNIFICANCE: Poly tobacco use may exacerbate poor tobacco-related health outcomes. However, certain tobacco product combinations may be more harmful than others. In order to address health disparities, it is important to differentiate types of polyuse by race/ethnicity to create responsive tobacco control policies. **METHODS:** We used nationally representative data (ages 18+) from the National Health Interview Survey (2016-2018) to produce weighted estimates of polyuse for four racial/ethnic groups (Non-Hispanic (NH) White, NH Black, NH Asian, Hispanic) across five product categories: cigarettes, e-cigarettes, cigars (traditional, cigarillos, filtered), pipes (regular, hookah), and smokeless tobacco. Current use was defined as use on 10+ days of the past 30 days for cigarettes, e-cigarettes, and cigars, and use some days or every day for pipes and smokeless tobacco. **RESULTS:** Among the 84,652 respondents, polyuse (use of 2+ products) was highest among NH White respondents at 2.2% (95% CI 2.1-2.4), followed by NH Black (1.7%; 95% CI 1.4-2.2), Hispanic (1.0%; 95% CI 0.8-1.3), and NH Asian respondents (0.7%; 95% CI 0.5-1.1). The majority of polyuse consisted of dual use of cigarettes and one other product, with specific combinations varying across racial/ethnic group. The most common combination was dual use of cigarettes and e-cigarettes, accounting for over 30% of NH White (32.6%; 95% CI 29.5-35.9), NH Asian (35.9%; 95% CI 16.9-60.6), and Hispanic (35.3%; 95% CI 24.0-48.5) polyuse. Among NH Black polyusers, only 14.8% (95% CI 9.2-22.7) reported dual use of cigarettes and e-cigarettes, with dual use of cigarettes and cigars more common at 38.4% (95% CI 29.6-48.2). NH Black polyusers also had the highest proportion of use of three or more products at 19.4% (95% CI 11.1-31.6), compared to 9.3% (95% CI 7.4-11.6) of NH White and 5.4% (95% CI 2.3-12.1) of Hispanic polyusers. **CONCLUSION:** Concurrent use of combustible products, like cigarettes and cigars, may exacerbate health problems, while substituting e-products may reduce health risks. NH Black polyusers may be at increased risk of poor health outcomes based on their polyuse profile.

FUNDING: Federal

PS2-127

ELECTRONIC CIGARETTE USER REACTIONS TO A HYPOTHETICAL NICOTINE CONCENTRATION REDUCTION IN ELECTRONIC CIGARETTE LIQUID

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INTRODUCTION: Regulations limiting nicotine in electronic cigarettes (ECIGs) have been proposed or implemented. Little is known about how ECIG users may react to a reduction in ECIG liquid nicotine concentration.



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METHODS: We used concept mapping, to describe ECIG users' reactions to a 50 percent reduction in the nicotine concentration of their ECIG liquids. In 2019, adult current ECIG users who reported using an ECIG liquid with nicotine concentration greater than 0 mg/ml or percent completed an online study. Participants (n = 72; 48.7% women; mean age = 34.8, SD = 10.8) brainstormed statements that completed a prompt: "If the e-liquid that I use now in my e-cigarette/vaping device was only available in half the nicotine concentration or amount that I use now, a specific action I would take or a specific reaction I would have is..." Participants sorted a final list of 67 statements into piles of similar content and rated statements on how frequently they had experienced them (1 - Definitely NOT true to 7 - Definitely true). Multidimensional scaling analysis identified thematic clusters. **RESULTS:** Eight clusters were identified: 1) Replacement Product Seeking, 2) Mental Preparations and Expectations, 3) Use the New Liquid, 4) Information Seeking, 5) Compensation Behaviors, 6) Opportunity for ECIG Reduction, 7) Physical and Psychology Effects, and 8) Replacement with non-ECIG products and behaviors. The highest rated (i.e., most likely) cluster Replacement Product Seeking included statements about searching for different flavors, devices, or brands to get higher nicotine concentrations and searching multiple sources for these products. The lowest rated (i.e., least likely) cluster Replacement with non-ECIG Products and Behaviors included statements describing using other tobacco or nicotine products. **CONCLUSIONS:** If nicotine concentrations were decreased in ECIG liquids to reduce nicotine exposure and risk of dependence, ECIG users may attempt to purchase different ECIG products or modify their products to achieve desired effects. To be most effective, ECIG liquid nicotine concentration regulations likely need to be uniform across all products and retailers.

FUNDING: Federal

PS2-128

E-CIGARETTE FLAVOR PREFERENCES AND CIGARETTE SMOKING AMONG ADOLESCENT MALES

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Significance: An estimated 81% of adolescent e-cigarette users vape flavored e-cigarettes. Male adolescents in particular gravitate towards tobacco- and menthol-flavored e-cigarettes. Despite links between flavored e-cigarette use and susceptibility to cigarette smoking, limited evidence exists on the relationship between flavored e-cigarette use and subsequent cigarette smoking among adolescents. This study examined whether the type and number of e-cigarette flavors tried by adolescent males predicted their escalation to cigarette smoking. **Methods:** We used data from the Buckeye Teen Health Study, a prospective cohort of adolescent males residing in rural Appalachian and urban areas of Ohio. We analyzed e-cigarette ever users who were not current (past 30 days) cigarette smokers (n=105; mean age=15.1; 78.1% non-Hispanic white). A log-binomial model was used to estimate the age-adjusted relative risk of current cigarette smoking during the first (1 to 12 months) and second (13 to 24 months) year of follow-up. **Results:** Fruit, candy, vanilla, mint, and tobacco were the five most common flavors the adolescents tried. Among these, trying a mint-flavored e-cigarette predicted incident current cigarette smoking during the first year of follow-up (aRR: 2.21, 95% CI: 1.1-4.47, p=0.027) although the effect was only marginally significant during the second year (aRR: 1.67, 95% CI: 0.94-2.94, p=0.078). Similarly, trying three or more e-cigarette flavors, compared to trying one flavor, significantly increased risk of incident current cigarette use during the first year of follow-up (aRR: 2.41, 95% CI: 1.12-5.19, p=0.024) but not during the second year (aRR: 1.82, 95% CI: 0.96-3.26, p=0.069). **Conclusion:** Use of mint-flavored e-cigarettes and having tried more flavors predicted initiation of current cigarette smoking over one year among adolescent males. Findings support the inclusion of mint in the FDA's proposed e-cigarette flavor ban. **Funding:** This study was funded by the National Cancer Institute and the Food and Drug Administration Center for Tobacco Products (P50CA180908).

FUNDING: Federal

PS2-129

PUBLIC-PRIVATE COLLABORATION: EXPLORING A NEW MODEL FOR TOBACCO TREATMENT SPECIALIST TRAINING

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Significance: In North Carolina, we are exploring a new model of tobacco treatment specialist (TTS) training in which university-based investigators and clinicians collaborate with the state health department to more effectively target and serve vulnerable smoking populations (e.g., rural, low income, and racial/ethnic minority individuals who smoke). In this model, tobacco control experts within the state public health agency, whose focus is improving population health and health equity within the state, help to bring TTS training to populations of need across the state. The TTS program then tailors training courses to meet the state-specific needs of target populations and partners with local tobacco control leadership to provide off-site trainings in areas of demonstrated need. **Methods:** We report outcomes from the Duke-UNC Tobacco Treatment Specialist Training Program, a collaboration between the Duke Smoking Cessation Program, UNC Tobacco Treatment Program, and the North Carolina Tobacco Prevention and Control Branch. Over the past 3 years, 341 learners participated in the TTS program. A total of 251 TTS program participants from North Carolina consented to answer questions relevant to their work with tobacco users, including their employment setting (i.e., site of employment, job description) and demographics of the populations they serve. **Results:** Among TTS program participant respondents, there was representation from 56% of North Carolina's 100 counties, including 9 Tier 1 counties, a state-level designation of the most economically distressed counties in North Carolina. In total, 82 (33%) of respondents practiced in rural counties. Compared to state rates of Medicare/Medicaid coverage and uninsured status, 67% of respondents estimated an overrepresentation of Medicare/Medicaid patients, and 53% reported an overrepresentation of uninsured patients. Over half (51%) of respondents indicated that a majority of their patient population was non-White. **Conclusion:** Results suggest that this new model—TTS training through a public-private partnership—has been able to meet the desired goal of reaching underserved communities across North Carolina.

FUNDING: Federal

PS2-130

DISPOSITIONAL OPTIMISM AND OPTIMISTIC BIAS FOR LUNG CANCER RISK PERCEPTION: IMPLICATIONS FOR ENGAGEMENT IN SMOKING TREATMENT AMONG SOUTHERN COMMUNITY COHORT STUDY SMOKERS

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Significance: Accurate lung cancer risk (LCR) perceptions are critical for smokers' treatment engagement. Dispositional optimism (positive future outlook) may facilitate engagement, but is often confused with optimistic bias (inaccurately low risk perception) which may hinder it. **Methods:** Diverse low-income smokers in the Southern Community Cohort Study (n=885) were surveyed for dispositional optimism/pessimism (Life Orientation Test-Revised subscales: 0-12, 0=neutral future outlook, 12=high optimism/pessimism) and LCR perceptions (Low/Ave/High). Combined self-reported and objective LCR (Tammemagi: Low/Med/High) defined LCR perceptions as accurate (perceived=objective) or biased (optimistic: perceived<objective; pessimistic: perceived>objective). One-way ANOVAs tested associations between optimism/pessimism and LCR perception biases. Multivariable logistic regressions tested independent associations of optimism/pessimism (1SD) and LCR perception biases with motivation (Low/High), confidence (Low/High), and smoking treatment attitudes (favorable/unfavorable), controlling for sociodemographics and nicotine dependence. **Results:** Mean dispositional optimism scores were 8.41 (SD=2.59) and pessimism scores were 5.65 (SD=3.02). LCR perceptions were balanced: 36% accurate; 26% optimistic bias; 37% pessimistic bias. Importantly, LCR perception biases were unrelated to dispositional optimism (F(2, 650)=0.21, p=0.81) or pessimism (F(2, 637)=0.97, p=.38). Higher dispositional optimism scores were associated with high confidence (Adjusted odds ratio [AOR]=1.58 [95% CI 1.32-1.90], p<.001) and embracing treatment (AOR=1.67 [95% CI 1.42-1.98], p<.001), but not motivation. Pessimistic bias (vs. accurate LCR perception) was associated with high confidence (AOR=1.61 [95% CI 1.11-2.32], p=.01) only. Optimistic bias and dispositional pessimism were unrelated to outcomes. **Conclusions:** Smokers high in dispositional optimism were confident and embraced smoking treatment. Importantly, optimistic and pessimistic LCR perception biases themselves were unrelated to disposi-



tional optimism and pessimism, reinforcing that they are different constructs. Contrary to expectations, optimistic bias was unrelated to outcomes. Research should investigate if dispositional optimism can be leveraged to improve engagement in smoking treatment.

FUNDING: Federal

PS2-131

SYRIAN CENTER FOR TOBACCO STUDIES-13 (SCTS-13): A PSYCHOMETRICALLY VALIDATED INSTRUMENT FOR MEASURING NICOTINE DEPENDENCE (ND) AMONG ADOLESCENT WATERPIPE SMOKERS

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Significance: Waterpipe tobacco smoking (WTS) has surged globally among adolescents and produces nicotine dependence (ND), but no psychometrically validated ND instruments have been developed for this population. **Methods:** We developed 28 self-report items that tapped multiple features of ND relevant to WTS and administered them to 192 past month waterpipe smokers in a school-based cohort study in Beirut, Lebanon. Students averaged 15 years of age when items were administered and dependence-related outcomes were examined over 3 subsequent waves, 6 months apart. Exploratory and confirmatory factor analyses (EFA and CFA) were applied to reduce items and verify factor structure. Internal consistency and convergent, discriminant, and predictive validity of the resulting instrument were assessed. **Results:** The EFA yielded a single factor, 13 item solution (named the SCTS-13) that explained 91% of the total variance in responses, had excellent internal consistency (Cronbach's alpha = 0.87), and captured several positive reinforcement (e.g., smoking makes me feel happy or energetic)-, negative reinforcement (e.g., smoking reduces irritability) -, and social/cognitive-related (e.g., smoking with friends or in café) features of ND. The CFA indicated good model fit across several indices (SRMSR = 0.06, RMSEA = 0.08, CFI = 0.91). Convergent validity was indicated by moderately high correlations between the SCTS-13 and the Lebanon Waterpipe Dependence Scale-10J and the Hooked on Nicotine Checklist. Discriminant validity was indicated by low positive correlations with depression and perceived stress scales. Higher dependence scores on the SCTS-13 predicted several outcomes at subsequent waves including greater chronicity of waterpipe use (greater amount, frequency, and session duration of smoking, and greater likelihood of having increased smoking frequency over time), less interest in quitting, shorter duration of abstinence, greater perceived addiction, and smoking alone (vs. socially). **Conclusion:** The SCTS-13 is a promising brief self-report instrument to assess ND among adolescent waterpipe smokers. **ACKNOWLEDGEMENTS:** Funded by U.S. National Institutes of Health grants R01TW010654 and R03TW07233

FUNDING: Federal

PS2-132

PROSPECTIVE ASSOCIATIONS OF E-CIGARETTE AND CIGARETTE USE WITH MARIJUANA USE BEHAVIORS AND RISK PERCEPTIONS AMONG U.S. ADOLESCENTS

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Significance: A growing body of research has shown a connection of e-cigarette use and subsequent cigarette use. However, less research has prospectively examined the connection of e-cigarette use and other substance use. We examined the prospective association of e-cigarette with and without cigarette use and how that is associated with marijuana use and marijuana use risk perceptions 1 year later in a national sample of 12th graders. **Methods:** This study used data from the Monitoring the Future (MTF) panel study of 12th graders in 2014 who were followed up one year later in 2015 (n=305). We compared 12th graders who used: (1) neither e-cigarettes nor cigarettes (78.6%), (2) only e-cigarettes (10.3%), (3) only cigarettes (3.4%), (4) both e-cigarettes and cigarettes (7.7%) in the past 30 days on odds of marijuana risk perceptions and past 30-day marijuana use at baseline and at follow up. **Results:** 40.1% of e-cigarette only users, 38.9% of cigarette only users, 53.1% of e-cigarette + cigarette users and 13.2% of nonusers reported past 30-day marijuana use at baseline. When controlling for baseline marijuana risk perceptions, sex, and race/ethnicity, e-cigarette only users were less likely to perceive marijuana as risky at follow up compared to nonusers (OR: 0.22; 95% CI: 0.05, 0.89) as were those who used both cigarettes and e-cigarettes at baseline (OR: 0.05; 95% CI: 0.01, 0.56). Similarly, e-cigarette only users were more likely to report past 30-day marijuana use at follow up compared to nonusers (OR: 3.55; 95% CI: 1.41, 8.98) as were those who used cigarettes and e-cigarettes (OR: 12.24; 95% CI:

3.57, 41.91). Cigarette only users were not significantly different from nonusers in odds of marijuana use or marijuana use risk perceptions at follow up. **Conclusions:** These results suggest e-cigarette, even when not in conjunction with cigarette use, may be a marker of marijuana risk during the transition from adolescence to young adulthood. Consistent with Problem Behavior Theory, the link of e-cigarette and marijuana use may strengthen in the future with the increasing trend for adolescents to vape marijuana.

FUNDING: Federal

PS2-133

DIRECT PATIENT OUTREACH INCREASES UTILIZATION OF SMOKING CESSATION SERVICES WITHIN A CANCER CENTER

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Significance: Smoking leads to approximately 30% of all cancer deaths, but most smokers who receive a diagnosis of cancer do not quit smoking. The National Cancer Institute (NCI) has mandated that all NCI-associated cancer centers should provide smoking cessation treatment. Unfortunately, many challenges arise when attempting to engage smokers in a smoking cessation program during cancer treatment. The Duke Cancer Center Smoking Cessation Program (DCCSCP) has been exploring multiple approaches to increase utilization of smoking cessation services. **Methods:** We report outcomes from three referral methods into the DCCSCP: 1. Traditional Referral (a provider—often an oncologist—refers their patient to smoking cessation services); 2. Best Practice Advisory (BPA; a provider responds to an alert within the electronic health record and places a referral); and 3. Direct Patient Outreach (a list of current smokers receiving cancer services is generated through the electronic health record; these patients are then contacted directly by phone, email, or other methods). Traditional Referral and BPA were assessed for twelve months; Direct Patient Outreach was pilot tested for one month. **Results:** Over a 12-month period 6,040 current smokers received services at the Duke Cancer Center, and 126 patients attended a DCCSCP appointment (91 from Traditional Referral, 8 from BPA, and 27 from Direct Patient Outreach). During the one-month period in which Direct Patient Outreach was pilot tested, the service utilization rate (number of smokers treated at the DCCSCP divided by the total smokers seen at the cancer center) was 6.9% (Traditional Referral = 1.5%, Best Practice Advisory = 0.1%, Direct Patient Outreach = 5.4%). The service utilization rate for Direct Patient Outreach was superior to Traditional Referral (p < 0.001), and Traditional Referral was superior to BPA (p < 0.001). **Conclusion:** Direct Patient Outreach appears to be an effective approach to patient engagement for smokers receiving cancer treatment.

FUNDING: Federal

PS2-134

PSYCHOSOCIAL MECHANISMS ASSOCIATED WITH TOBACCO USE IN SMOKERS WITH AND WITHOUT SERIOUS MENTAL ILLNESS

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Significance: Smoking disproportionately affects individuals with serious mental illness (SMI). A recent review identified potential psychosocial barriers to cessation in smokers with SMI (e.g., high craving, stress, and exposure to smoke/smokers, low risk perceptions and cessation support), but noted that few studies have included a control group or used validated assessment tools. We compared validated measures of psychosocial barriers to cessation in smokers with and without SMI living in the same geographic area. **Methods:** Smokers with SMI (n=58) and without SMI (n=83), enrolled in two parallel clinical trials of very low nicotine content cigarettes, completed the following measures at baseline: Brief Wisconsin Inventory of Smoking Dependence Motives (WISDM) scale, Fagerstrom Test of Cigarette Dependence (FTCD), Questionnaire on Smoking Urges (QSU), Respiratory Health Questionnaire, Perceived Health Risks Scale, Perceived Stress Scale, and Environmental and Social Influences on Tobacco Use Questionnaire (ESTQ). Because the ESTQ had not been validated, we first conducted construct validation in a larger sample of smokers without SMI. Scores were compared across samples using independent-sample t-tests and chi-squared tests. **Results:** Smokers with and without SMI smoked a similar number of cigarettes per day, but those with SMI had higher breath CO levels, urinary total nicotine equivalents, FTCD scores and craving (QSU, WISDM) scores (p's < .05). Smokers with SMI reported higher respiratory symptoms, but had lower perceived health risks of smoking (p's < .05). Smokers with SMI were more likely to have received quit advice from a medical professional within the last six



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months compared to smokers without SMI ($p < .05$). Perceived stress and exposure to smoke/smokers did not differ across samples. Conclusions: Our findings align with prior studies of psychosocial cessation barriers in people with SMI, and advance this research by comparing smokers with and without SMI on several validated measures. Findings highlight the need for interventions that increase risk awareness and reduce craving among smokers with SMI. Funding: Supported by a grant from the National Institute on Drug Abuse and the Food and Drug Administration Center for Tobacco Products (U54 DA031659) and a NIDA pre-doctoral fellowship award (F31DA049460). The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the Food and Drug Administration.

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PS2-135

DARKER SKIN COLOR IS ASSOCIATED WITH A LOWER LIKELIHOOD OF SMOKING CESSATION AMONG MALES BUT NOT FEMALES

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Darker skin color is associated with discrimination and unfair treatment for many individuals and may contribute to persisting health disparities. This study examined whether darker skin color was associated with smoking cessation and whether this association was moderated by sex and race. This study also explored whether biological and psychosocial factors, including nicotine and cotinine concentrations, discrimination, distrust, and neuroticism, mediated this association. The data for this study came from a prospective smoking cessation intervention that recruited 224 Black and 225 White adults from Kansas City, Missouri, in February 2013. Skin color was assessed using a DermaSpectrometer to measure melanin contained within the skin. Point prevalence smoking abstinence was biochemically-verified with salivary cotinine and assessed at weeks 4 and 26. Hierarchical logistic regression analyses were conducted to evaluate hypothesized relations between skin color and smoking cessation. Results indicated that the effect of skin color on smoking cessation was moderated by sex. Among males, darker skin color, which was more common among Black than White males, lowered the odds of smoking abstinence at weeks 4 (OR = 0.60 [95% CI = 0.36, 0.99]) and 26 (OR = 0.52 [95% CI = 0.29, 0.91]). Skin color did not predict smoking cessation among females. Skin color was positively correlated with discrimination ($r = 0.15, p = 0.02$), cynicism/distrust ($r = 0.14, p = 0.03$) and neuroticism ($r = .24, p < 0.01$) among males only, but skin color was not correlated with nicotine or cotinine concentration among both males and females. Though skin color was significantly correlated with perceived discrimination, cynicism/distrust, and neuroticism among males, these factors did not mediate the association between skin color and smoking cessation. Skin color may contribute to cessation-related health disparities among Black males, but more research is needed to understand the psychosocial and biological mechanisms through which skin color influences tobacco cessation.

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PS2-136

SECONDHAND SMOKE EXPOSURE AMONG PREGNANT AND LACTATING VIETNAMESE WOMEN

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SIGNIFICANCE: Traditional gender roles discourage cigarette smoking among Vietnamese women, while male smoking is considered normative. **METHODS:** The goals of this pilot project were to: [1] describe the rates, harm perception and avoidance of maternal cigarette smoking and second hand smoke exposure (SHSE) across the prenatal period and first postpartum year; and [2] determine the preferred delivery mode for a smoke avoidance intervention. Participants were 120 lactating women recruited into a study of postpartum depression in a northern province in Vietnam. **RESULTS:** Women were, on average, 28.3 years of age (range 18-39). 64% of women completed high school or obtained additional education and all were married. Most women had two children (64%) and had four to six individuals living in their homes (87%). None of the women reported smoking during pregnancy or the postpartum period. Tobacco smoking (cigarette, water tobacco, pipe, cigar, and terracotta bowl pipe) inside the home was allowed on special occasions in 55% of homes and 30% of families did not regulate smoking

in their homes. Most women (85%) experienced SHSE in the home during pregnancy from husbands (29%), fathers (19%), brothers (48%), and guests (76%). Frequency of prenatal SHSE was weekly or more frequently for 39% of women. Most women (83%) thought that cigarette smoking could harm their unborn child "a lot" and 92% of women wanted and tried to avoid SHSE while pregnant; 28% felt supported in their efforts. Most women felt that postpartum cigarette smoking could harm their baby's health "some" (3%) or "a lot" (93%). While most women (94%) wanted to avoid postpartum SHSE, 28% were exposed at least once weekly. During pregnancy, women's best sources of information were the internet (83%) and health workers (20%). YouTube and Facebook use was common among women, as was Zalo (a mobile messaging app). Most women (72%) prefer a text message intervention program over newsletter, DVD, or video link. 97 women had a smartphone and 26 women had a cellphone. **CONCLUSION:** SHSE during pregnancy and the first postpartum year is concerning for Vietnamese women and should be the target of intervention efforts.

FUNDING: Federal

PS2-137

A HISTOGRAM OF THE RECALLED AGE OF INITIATION OF CIGARETTE USE AMONG ADULTS 26-34 YEARS OLDS

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Significance: The National Survey on Drug Use and Health (NSDUH) from 2002-2012 reported the distribution of the recalled age of initiation of cigarette use among adults (26-34 year olds) in the USA. In 2013-2014, the Population Assessment of Tobacco and Health (PATH) at wave 1 assessed the recalled age of initiation of cigarette use among U.S. adults. With the addition of new tobacco products to the U.S. marketplace, this study aims to determine whether there are significant changes in the distribution of the age of initiation for cigarette use among adults 26-34 years old after this change in the tobacco marketplace by comparing the distribution of the recalled age of initiation from NSDUH versus PATH. **Methods:** Secondary analyses were conducted in the restricted PATH data for wave 1 (2013-2014) on participants who answered yes to the question of ever smoking a cigarette and who reported their recalled age of initiation of ever cigarette use. In addition, participants were classified as either having smoked 100 or more cigarettes in their lifetime or no. One histograms of the recalled age of initiation of all ever cigarette users as well as two additional histograms representing those having smoked 100+ cigarettes or no were estimated in order to compare those PATH results with NSDUH. Sampling weights were incorporated into analyses. **Results:** Histograms will be described graphically. The histogram of the recalled age of initiation for ever users of cigarettes from PATH has only one mode, whereas the NSDUH histogram has three modes. **Conclusion:** The results indicate that the recalled of age of initiation has shifted most frequently to a single age instead of in multiple starting ages as it was described in the NSDUH histogram. The effect of the availability of e-cigarettes in the market place on the age of initiation of cigarettes among adults still needs to be determined in future studies.

FUNDING: Federal; Other

PS2-138

DIFFERENCES IN SOCIO-ECONOMIC RESOURCES AMONG CURRENT AND FORMER SMOKERS OFFERED LUNG CANCER SCREENING

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Significance: It is important to determine if traditional well-correlated socio-economic factors remain significant for smoking and cessation in patients who engage in lung cancer screening (LCS) decision interactions. We aim to evaluate, 1) differences in socio-economic factors between patients who actively or formerly smoked who are offered LCS, and, 2) differences in socio-economic factors between patients who actively smoke who are able to achieve cessation and those who are not at 1-year follow-up. **Methods:** We included clinically eligible participants from 3 facilities with established LCS programs. All facilities reported completing a decision interaction to include smoking counseling before participants enrolled. We utilized surveys conducted after the decision-making interaction but before the actual low-dose computed tomography scan, and 1 year after. Surveys measured self-reported socio-economic factors, demographics, and smoking status, at baseline, and smoking behaviors, including the 7-day point prevalence abstinence, at 1-year follow-up. We describe the baseline data for socio-economic variables. We used Pearson's chi-squared tests to compare socio-economic factors of active and former smokers, as well as active smokers who are



able to quit and those who are not after 1 year. **Results:** We included 224 participants who actively smoked and 167 participants who reported formerly smoking cigarettes; 37% and 48% reported educational attainment of high school or less ($p=0.17$), 75% and 78% were not employed at the time of the baseline survey ($p=0.51$), and 44% and 24% reported an annual household income of less than \$30,000 ($p=0.001$), respectively. To date, 208 active smokers at baseline completed 1-year follow-up. There were no significant differences in socio-economic factors between those who did ($n=112$) or did not ($n=96$) self-report quitting smoking at follow-up. **Conclusion:** Income was significantly lower for participants who actively smoked, however our findings suggest that patients offered LCS may have other individual- or system- level characteristics that influence smoking status and cessation beyond other traditional socio-economic factors.

FUNDING: Nonprofit grant funding entity

PS2-139

MODIFICATIONS TO ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) A CONTENT ANALYSIS OF YOUTUBE VIDEOS

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Significance: Because user modification can alter the addictiveness and toxicity of electronic nicotine delivery systems (ENDS), more research is needed to understand the types, motivations, risks and information sources (such as YouTube) that lead to these product alterations. **Methods:** YouTube was searched using 28 keywords (vape, mods, custom build) selected based on interviews of ENDS users and current literature. Removing duplicates, non-English videos, videos posted before 2013 or not featuring modifications resulted in a final sample of 161 videos. A random 10% was coded by 5 raters to assess reliability (Krippendorff's $\alpha > .75$). The videos were then coded by 5 coders. **Results:** Videos ranged from 1 to 108 minutes in length ($Mdn = 9.24$, $SD = 12.04$). Most common source was individuals (80%) followed by retailers (11%). Presenters were largely male (94%), Caucasian (75%), and over 26 years old (76%). Most videos gave "how to" instructions (88%), but few offered warnings (19%) or mentioned commercially available alternatives to modifications they presented (9%). The ENDS devices most often featured were Drippers (45%) and Tanks (25%). Modifications were mainly applied to open devices (77%), with focus on the coil (44%). Modifications to the wick (5%), battery (3%), or e-juice (1%) were less often discussed. Only 6% of videos featured closed systems, with 75% of those videos focused on re-filling pods. None of the videos showed how to adjust batteries or build dripping devices. Most videos used positive tone to portray ENDS modifications (63% positive vs. 1% negative) but were either neutral or positive in their portrayal of ENDS devices overall (52% neutral, 47% positive, 1% negative). **Conclusions:** YouTube videos featuring ENDS modifications did not depict some potentially harmful practices, such as modifying a device for "dripping" or increasing battery power. However, the majority of videos gave "how to" instructions without warning viewers and failed to mention commercial alternatives. ENDS devices and modifications were depicted in a favorable light, potentially detracting from nicotine cessation campaigns aimed at youth—a primary YouTube audience.

FUNDING: Federal

PS2-140

INITIAL VALIDATION OF THE ELECTRONIC CIGARETTE VERSION OF THE SMOKING EXPECTANCY SCALE FOR ADOLESCENTS

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Significance: The initiation and/or continuation of tobacco product use has shown to be predicted by users' expectations, or their beliefs about the potential costs and benefits of use. Early work suggests a similar pattern for use of electronic cigarettes (e-cigs), though validated measures for this purpose do not currently exist for adolescents. The current analysis sought to assess the construct and convergent validity of the *Smoking Expectancy Scale for Adolescents* adapted for e-cig use (EESA). **Methods:** Adolescents ($N=569$; 14-18 years of age; 60.1% female; 82.7% White) were recruited from high schools and an adolescent medicine clinic in central-northern Appalachia. Participants completed not only the EESA but also a variety of questionnaires that assessed their e-cig use status and a variety of other conceptually-related variables (e.g. peer and parental e-cig use). **Results:** Exploratory factor analysis revealed a three-factor solution - Costs, Social Benefits, and Affective Benefits - that retained all EESA items. All factors demonstrated strong internal consistencies (α 's = 0.88-0.97) and were correlated significantly and in the expected direction with peer e-cig use,

conscientiousness, and sensation seeking (p 's < .01). Nonusers perceived higher costs but lower affective and social benefits than lifetime and current e-cig users, and lifetime users perceived higher costs and lower affective benefits than current users (F 's > 19.90, p 's < .001). Moreover, adolescents with intentions to use e-cigs and parents who use e-cigs had lower perceived costs and higher affective and/or social benefits than their counterparts (t 's > 3.10, p 's < .01). **Conclusion:** Results support the initial validity of the EESA across the factors of Costs (e.g., adverse health effects, addiction), Affective Benefits (e.g., relaxation, stress reduction), and Social Benefits (e.g., peer respect). Understanding expectancies of e-cig use can inform the development of regulatory policies that influence perceived costs and benefits.

FUNDING: Federal; Academic Institution

PS2-141

VARIATIONS IN SUBSTANCE USE AND ABUSE AMONG SEXUAL AND GENDER MINORITIES BY RACE/ETHNICITY

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Objectives: The goal of this study is identifying racial/ethnic disparities in substance use and abuse among sexual and gender minorities (SGMs). This study is the first to analyze the combined effect of SGM identity and race/ethnicity on substance use and abuse. **Methods:** A nationally representative sample of adults ($n=35,981$) from the 2012-2013 National Epidemiological Survey on Alcohol and Related Conditions-III provided information on SGM status, tobacco (including cigarettes, pipes, e-cigarettes, chewing tobacco, and cigars), alcohol, and marijuana use and abuse, and demographics. Weighted multivariable logistic regression models were used to assess their relationships by race/ethnicity. **Results:** SGMs were more likely to use and abuse most substances when compared to their heterosexual counterparts. For example, bisexual adults were significantly more likely to use tobacco (AOR = 2.58, 95% CI = 2.02-3.28) and meet criteria for tobacco use disorder (AOR = 2.42, 95% CI = 1.92-3.05) than heterosexual adults. Gay/lesbian adults were more likely than heterosexuals to meet criteria for each examined substance use disorder (tobacco, alcohol, and marijuana; $p < 0.05$). These relationships were stronger among racial/ethnic minority SGMs. For instance, current tobacco use was 41.7% for Hispanic bisexuals, 2.5 times the prevalence of Hispanic heterosexuals (16.6%); in comparison, bisexual non-Hispanic (NH) whites had a tobacco use prevalence (47.4%) that was only 1.7 times higher than their heterosexual counterparts (27.4%). Black gay/lesbian adults were more likely to be current marijuana users than heterosexual black adults (AOR = 2.28, CI = 1.44-3.59) whereas NH white gay/lesbian adults did not have a significantly higher prevalence than NH white heterosexuals. **Conclusions:** The findings of this study reflect the need for resources addressing substance use and abuse among bisexual and SGM racial/ethnic minority communities to reduce disparities. Research needs to explore the psychosocial and environmental factors involved in increased substance use and abuse to inform the development of prevention and treatment programs targeting bisexuals and SGM racial/ethnic minorities.

FUNDING: Federal

PS2-142

EXPLORING MOTIVATION TO QUIT SMOKING IN DUAL USERS OF ELECTRONIC AND TOBACCO CIGARETTES: A QUALITATIVE INTERVIEW STUDY

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Significance UK surveys of electronic-cigarette (EC) users indicate that one of the most common reasons for use is to quit smoking. However, around 45% of EC users continue to smoke (dual use). We sought to understand motivation to quit smoking in dual users using the COM-B model of behaviour change and the Theoretical Domains Framework (TDF). **Methods** We conducted 39 semi-structured interviews with volunteers from the UK who had been dual using for at least 3 months and were age 18+ years. We purposively sampled based on age, gender and intention for smoking when beginning to vape (to quit, to reduce only or to neither quit nor reduce). Interviews were analysed using the framework method. The topic guide and analysis were informed by COM-B and TDF. **Results** Participants had been dual using for between 0.3-10 years (mean 3.2 years). The majority were smoking a reduced number of cigarettes and intended to continue vaping at least for the short term. For most participants their intentions regarding quitting remained the same whilst vaping but the timeframe for quitting had lengthened, and some experienced increases and others decreases in belief in capability to quit smoking. At the time of interview, some participants were intending to



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quit smoking and actively working towards this (active quitter), others were intending to quit smoking in the future but not actively working towards this (inactive quitter), and a small number did not intend to quit smoking in the future (no intention to quit). Active and inactive quitters were often trying to or planning to cut down the number of cigarettes they smoked gradually over time. These groups highlighted a range of reasons for continuing to smoke which were both related and unrelated to EC use, and some felt that although EC were helping they would need something additional to help them quit. Dual users with no intention of quitting felt EC use would make it easier to quit but they did not envision themselves doing so in the short or long term. **Conclusions** Many dual users intended to quit smoking but not all were actively working towards this goal, and proximity of the goal was often distant or undefined. Some dual users may benefit from additional support to help them quit smoking.

FUNDING: Nonprofit grant funding entity

PS2-143

BIOMARKER LEVELS AMONG E-CIGARETTE USERS - A SYSTEMATIC REVIEW

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Objective: There have been few systematic reviews and meta-analyses conducted on health impacts of e-cigarettes and toxicity of e-cigarettes. To better understand the harms and benefits of these products, and to systematically address policy and regulation related to these issues, there is a need to integrate published literature into a systematic review. This review aims to systematically review articles on e-cigarettes and biomarker measures of exposure and harm. **Methods:** A systematic review of original published empirical research literature on e-cigarettes and tobacco-specific biomarkers of harm was conducted through March 15, 2019. A detailed search strategy was implemented in the PubMed, Cochrane Library, Web of Science, and EMBASE databases. Included studies presented empirical findings on tobacco-specific biomarkers of harm: (1) Exhaled carbon monoxide; (2) Tobacco alkaloids; (3) Tobacco-specific nitrosamines; and (4) Volatile organic compounds. Data from included studies were synthesized qualitatively by topic. **Results:** A total of n=17 articles are included in this review. A majority of the studies indicated reduced biomarker exposure of harm among exclusive e-cigarette users and former smokers who switched to e-cigarette use compared to combustible cigarette smokers and dual users. Despite additional nicotine delivered by newer e-cigarettes, over half the studies indicated little to no difference in nicotine and cotinine levels between exclusive e-cigarette users and combustible cigarette users or dual users. Furthermore, the included RCTs suggest e-cigarettes are at least equally effective as nicotine replacement therapy for quitting combustible cigarette smoking. **Conclusion:** This review demonstrates the importance of biomarkers for quantifying the risk of new tobacco products. The results from this review indicate a significant reduction in biomarkers of harm among e-cigarette users compared to cigarette smokers. The results suggest there may be a net population benefit if all current smokers switched to exclusive e-cigarette use. More longitudinal and randomized contrails are needed to efficiently measure the impact of e-cigarettes on health outcomes.

PS2-144

ANTI-VAPE ATTITUDES ARE ASSOCIATED WITH LOWER RATES OF ENDS USE AND INTENTIONS AMONG YOUTH AND YOUNG ADULTS

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Significance: Mass media campaigns can address the growing use of E-cigarettes/Vapes (ENDS) among young people but we first must determine which attitudes/beliefs are associated with ENDS use and intentions. **Methods:** We conducted a national survey of young people, ages 15-24 (n=3,039) in May 2018. We assessed agreement with a series of 63 knowledge, attitude and belief statements about ENDS. Following factor analysis 11 attitudes remained and formed 3 factors: Harms Knowledge (e.g. "... contain dangerous chemicals"), Un-Appeal (e.g. "... look silly or childish"), and Social Unacceptability of ENDS (e.g. "... is not OK for people my age"). Together these subscales form an "Anti-Vape Scale" (AVS) such that greater scores represent greater knowledge about and more unfavorable attitudes toward ENDS. **Results:** The AVS consists of 11 items ($\alpha=0.82$), the Harms Knowledge subscale consists of 4 items, the un-Appeal subscale consists of 3 items, and the Social Unacceptability subscale consists of 4 items. Separate logistic-regression models examined relationships between each subscale and tobacco use and intentions adjusted for age, gender, race/ethnicity, and subjective financial situation. Scores on the AVS significantly predicted current use of

ENDS (aOR=0.30, $p<.001$) as well as current use of cigarettes (aOR=0.39, $p<.001$) and cigars (aOR=0.20, $p<.001$). Similarly, scores on the AVS, significantly predicted intention to use ENDS in the next year (aOR=0.29, $p<.001$) and predicted intentions to use cigarettes (aOR<0.30, $p<.001$) and cigars (aOR=0.16, $p<.001$). Score on the Harms Knowledge, un-Appeal and Social Unacceptability subscales were also significantly related to past-30 day use and intentions to use both ENDS and combustible tobacco products. **Conclusion:** We expect that mass-media campaigns that focus on decreasing the appeal of ENDS while increasing knowledge about the harms and perceptions of social unacceptability, will decrease young people's intentions to use ENDS and, with time, will reduce the rate of ENDS use. Future longitudinal research is necessary to validate the causal impact of public health messaging on ENDS use by young people. **FUNDING:** Other

PS2-145

IMPACT OF EMOTIONAL COMPETENCIES ON CURRENT E-CIGARETTE USE WITHIN A YOUNG ADULT SAMPLE

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Significance: Maladaptive emotional states are important drivers of tobacco use, but the mediating factors are poorly understood, particularly for e-cigarette use. Given that e-cigarette use has increased in prevalence and popularity, research examining motivating factors to engage in use is necessary. **Methods:** Survey data were collected from youth (18-25) attending a four-year university (N = 216, M-age = 20.41, 36.6% African American). Respondents answered questions about emotion dysregulation (Difficulties in Emotion Regulation Scale; DERS), positive/negative urgency (Urgency, Premeditation, Perseverance, Sensation Seeking, and Positive Urgency Scale; UPPS-P), affect (Positive and Negative Affect Scale, PANAS), distress tolerance (Distress Tolerance Scale, DTS); negative affect reduction outcome expectancies (NAROE) and current use. A path analysis was used to examine the direct effects of affect, the 3 emotional competencies (emotion dysregulation, positive and negative urgency, and distress tolerance), and NAROE on current use, as well as the mediational effects of NAROE. **Results:** Path analyses displayed a positive direct effect of negative urgency ($\beta = .209$; $p=.017$) on negative affect reduction outcome expectancies and direct effects of negative affect ($\beta = -.170$; $p=.032$), positive urgency ($\beta = -.180$; $p=.013$), and negative affect reduction outcome expectancies ($\beta = .257$; $p=.007$) on current use. Negative affect reduction outcome expectancies mediated the relationship between negative urgency and current use ($\beta = .052$, $p=.008$) and positive urgency and current use ($\beta = .037$, $p=.038$). **Conclusion:** Emotion competencies, specifically the ability to control one's impulses during highly emotional periods may play a role in e-cigarette initiation and maintenance. Emotional competencies may be helpful in implementing preventative and cessation programs.

FUNDING: Unfunded

PS2-146

COMPLIANCE WITH SAN FRANCISCO'S FLAVORED TOBACCO SALES PROHIBITION

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Significance: In June 2018 San Francisco voters upheld a comprehensive prohibition on sales of flavored tobacco products (including menthol) despite a \$12 million campaign against it by RJ Reynolds Tobacco. **Method:** In person visits to all retailers licensed to sell tobacco were conducted to educate them about the law between October-December 2018, with compliance inspections beginning in December 2018. **Results:** The Department of Public Health and volunteers conducted an educational campaign, including emailing retailers about the law, mailing a fact sheet poster to retailers, conducting 4 listening sessions with retailers, and visiting permitted tobacco retailers to educate them about the law and solicit questions, followed by compliance checks. In December 2018, 18% of the 356 stores inspected confirmed no flavored tobacco. Retailers were warned that they would be subject to permit suspension and/or administrative penalties if they did not come into compliance and were offered the opportunity to self-certify compliance by notifying the Department by text message when they had eliminated flavored tobacco products. Nine percent self-certified in December 2018, bringing total compliance to 26%. Among the 354 retailers inspected between January-March 2019, 294 were in compliance on initial inspection, and by March 2019, 204 non-compliant retailers had self-certified, bringing total compliance based on in-store inspections and self-certified compliance to 79% (561/710). Routine compliance inspections continued,



with total compliance reaching 84% (597/710), with 411 compliant on in-store inspection and the remaining 186 self-certifying) as of July 31, 2019. **Conclusion:** The San Francisco experience demonstrates that high compliance with a prohibition on the sale of flavored tobacco products is possible and can be achieved if implemented in a way that is sensitive to the needs of retailers. This experience can inform other localities and states that may be considering similar policies. An adequate period of in-person retailer education (3 months) followed up with compliance checks by enforcement authorities is essential to achieving high compliance.

FUNDING: Federal; State

PS2-147

DO PUBLIC REACTIONS TO VAPING UNDERMINE ADULT SMOKERS USE OF E-CIGARETTES

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Significance. Use of e-cigarettes has become a topic of widespread public, professional, political and media debate within the last few years with the result that the use of e-cigarettes may elicit both positive and negative reactions from those witnessing such use. This presentation will report data on the frequency with which adult smokers using the JUUL nicotine salt vaporizer report negative reactions from others to their vaping and the possible impact of those reactions. **Methods.** Cross sectional survey of U.S. adults reporting past 30 day use of the JUUL nicotine salt vaporizer. **Results.** Amongst current smokers who reported having used a JUUL in the last 30 days 16.8% (n=588) reported having experienced a disapproving reaction from family or friends; 17.1% reported negative public reactions. 18.7% of those who reported such negative reactions indicated that this had occurred within 3 to 5 times in the last 30 days; 5.2% indicated such reactions had occurred more than 10 times in the last 30 days. 39.3% (n=292) of those who reported having experienced negative reactions in the last 30 days indicated that this had resulted in their wishing to stop using the device; 37.3% indicated that those reactions had no impact on their use of the device and 23.2% indicated that it had made them more likely to continue to use the device. **Conclusions.** On the basis of these data it would appear that JUUL use, and possibly use of ENDS more broadly, has the capacity to elicit negative reactions on the part of those witnessing such use. Those reactions may mean that adult smokers are less willing to use the device in the presence of others and they may reduce the effectiveness of those devices in assisting smokers quit attempts.

FUNDING: Tobacco Industry

PS2-148

A PILOT INTERVENTION TO PREDISPOSE HEALTHCARE PROVIDERS TO OFFER BRIEF ADVICE

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Significance: Prevalence of tobacco use in Jordan is staggering, reaching 70% among men. Yet, the shortage in tobacco dependence treatment (TDT) services continues; TDT is offered only through 5 public clinics with fluctuating availability of providers and medications. Brief intervention (BI) is barely offered in primary healthcare largely due to the lack of awareness and skill among healthcare providers (HCPs). This pilot project sought to test an intervention that was developed to predispose HCPs to integrate BI into their practice. **Methods:** We designed an intervention consisting of a 1-hour predisposing session and a reminder tool, and supplemented that with referral to the Jordanian TDT Guideline. The predisposing session builds the case for TDT through highlighting nicotine addiction, the health effects of tobacco, and the prevalence of use in Jordan. It then presents BI as a cost-effective public health intervention and the components of the AAR (ask, advise, refer) model as an example, focusing on customizing advice for each individual through expanding knowledge on the various health effects. Finally, the session closes with a video demonstrating the brevity and ease of offering the BI. Participants then receive a reminder tool (wheel chart) that can prompt recall during their service to patients, and are encouraged to study the Jordanian TDT Guideline which includes a section on BI. At session conclusion, participants complete a feedback form to provide insight on their perception of the BI and their intention to offer it. **Results:** Through 14 predisposing sessions, we reached 242 HCPs, of which 90% (219/242) completed the feedback form. Of those responding, 90% (198/219) responded positively to the question on intention to implement the BI, 8% (18/219) were unsure, none responded negatively, and 3 HCPs provided no response. Among those intending to offer BI, 94% (186/198) agreed BI was beneficial, 88% (174/198) agreed it was easy to implement, and 85% felt confident to offer BI. Among those who were unsure, 78% believed BI to

be beneficial, but belief in its ease was at 44% and confidence in ability to offer it was at 50%. **Conclusion:** The majority of HCPs attending the predisposing sessions left believing BI is beneficial. However, belief in the ease of application and confidence in ability to implement were higher among those with intention to offer BI compared to those who were unsure. The intervention was able to drive positive intention through belief and confidence. It is a novel method to predispose HCPs to integrate BI into their practice.

FUNDING: Unfunded

PS2-149

SMOKELESS TOBACCO USE AND CARDIOVASCULAR DISEASE PREVALENCE: FINDINGS FROM POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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The long term use of combusted tobacco is thought to be more dangerous than the use of unburned tobacco. This study examines the prevalence of cardiovascular disease in long term users of cigarettes, smokeless tobacco, and dual user compared to never tobacco users. Data were available from the Population Assessment of Tobacco and Health survey Waves 1-3 (2013-2016). Tobacco use was defined as current exclusive use of smokeless tobacco, current exclusive use of cigarettes, current use of both, former exclusive use of smokeless tobacco, former exclusive use of cigarettes, former use of both, and never use of any tobacco product. Tobacco use was assessed at Wave 1 only. Cardiovascular disease (CVD) was defined as self-reported diagnosis of congestive heart failure, myocardial infarction, or stroke in any wave. Because of the low prevalence of CVD in younger participants and the nearly exclusive use of smokeless tobacco among males, analyses were restricted to males, 45 years of age and older. Analyses comparing odds ratios of CVDs for different tobacco use groups were evaluated controlling for demographic characteristics and the following CVD risk factors: hypertension, hypercholesterolemia, type 2-diabetes, COPD, and tobacco-related cancer. Among participants in this study, 45.5% were never users of any kind of tobacco, 13.5% were current cigarettes only users, 3.1% were current smokeless only users, 0.6% were current dual users, 4.8% were all other current users, 19% were former cigarette only users, 1.6% were former smokeless only users, 1.9% were former dual users, and 10% were all other former users. CVD prevalence over the first three waves of the PATH survey was 13%, 5.3% congestive heart failure, 4.5% stroke, and 7.8% myocardial infarction. Current smokeless tobacco users were not more likely to have CVD than never users (OR=1.092 [95% CI, 0.610-1.955]). Current cigarette users were more likely to have CVD than smokeless users (OR=1.814 [95% CI, 1.003-3.282]) and never users (OR=1.981 [95% CI, 1.469-2.672]). Current and former use of cigarettes was associated with cardiovascular disease compared to smokeless tobacco use. The prevalence of CVD among exclusive smokeless tobacco users was no different compared to never tobacco users.

FUNDING: Unfunded

PS2-150

INCENTIVIZED SMOKING CESSATION FOR INDIVIDUALS WITH TYPE 2 DIABETES: RESULTS FROM A RANDOMIZED CONTROLLED FEASIBILITY STUDY

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Significance: Individuals with type 2 diabetes (T2D) who smoke are at higher risk of accelerated micro and macrovascular complications. Patients face many challenging disease management and lifestyle changes that make smoking cessation difficult. Financial incentives improve cessation outcomes in a variety of populations. **Methods:** We conducted a pilot randomized controlled trial for smoking cessation for individuals with T2D to test varying lengths of contingency management using financial incentives. We also tested the feasibility of remote carbon monoxide (CO) devices and a smartphone application (app) to verify smoking abstinence daily. We recruited adult smokers with T2D willing to make a quit attempt and randomized participants to one of three groups: 12 weeks of incentives, 6 weeks of incentives, or no incentives. All participants received 12 weeks of smoking cessation treatment that included counseling and medication. Participants used a remote CO device and smartphone app to verify abstinence and complete daily assessments on urges, stress, and physical symptoms for 12 weeks. During incentive weeks,



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participants could earn \$20 per week for proof of abstinence. We measured engagement and conducted exit interviews to assess acceptability of the technology. Results: We enrolled 19 participants at a baseline visit and 16 returned the next week on their quit date to receive a smartphone and CO device. Remote engagement differed by group, with a median number of completed daily assessments of 71, 60, and 22 in 12-week, 6-week, and no incentives groups, respectively. Five out of nine participants in the incentive groups earned at least one incentive, and two earned all eligible incentives. Engagement remained high in both incentive groups, even for those who did not earn incentives and beyond the incentive period. Participants reported technology as simple to use and easy to integrate into their routine. Conclusion: We demonstrated feasibility of remote verification of abstinence for individuals with T2D. The potential to earn incentives and accountability of CO monitoring might increase engagement in a population that is used to monitoring glucose levels.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PS2-151

LONGITUDINAL EXAMINATION OF RISK FACTORS TO PREDICT VAPE-POD INITIATION AMONG COLLEGE STUDENTS IN TEXAS

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Significance Vape-pod use (e.g. JUUL) is increasingly prevalent among young adults. Relatively few studies, however, examine factors contributing to vape-pod initiation. The purpose of this study was to examine social norms and perceived harm regarding vape-pod use in the initiation of vape-pods one year later among college students. Understanding the potential risk factors for college students to initiating vape-pods is critical for developing effective prevention programs. Methods Data were drawn from a larger cohort of 5,482 students from 24 Texas colleges who participated in the longitudinal study, Project M-PACT. Participants completed an online survey in spring 2018 (Wave 7) and spring 2019 (Wave 8). Participants were 3,505 college students who were not current vape-pod users at Wave 7, aged 22-35 (M=25.57, SD=2.35; 66.5% female; 34.9% non-Hispanic white, 30.9% Hispanic, 19.2%, Asian, 7.8% African American, and 7.2% Other). Measures included self-reported perspectives of social norms (3-items) and perceived harm (2-items) toward vape-pod use at wave 7, and self-reported current vape-pod use (past 30 days) at wave 8. Results Overall, 6.2% of participants reported initiating vape-pod use from wave 7 to wave 8. Logistic regression analyses indicated that 2 out of 3 items for social norms were significantly associated with vape-pod initiation [friend vape-pod use OR=1.26 (1.06, 1.51); date someone who uses a vape pod OR=1.30 (1.13, 1.51)] over and above the covariates of sex, age, race/ethnicity and any other tobacco use (e.g. cigarettes, cigars, hookah, smokeless, and other ENDS products); however, social acceptability of vape-pod use was not significant. After controlling for the covariates, neither item for perceived harm (harmful to health and addictiveness) were significantly associated with vape-pod initiation. Conclusion Young adults' social norms regarding vape pod use continue to be an important predictor of initiating vape pod use. As there is little variability among young adults, harm perceptions do not predict vape-pod use. Based on these results, effective prevention/intervention programs should be developed to target social norms among young adults.

FUNDING: Federal

PS2-152

ASSOCIATION BETWEEN TOBACCO PRODUCT USE AND MENTAL HEALTH AMONG US ADULTS FINDINGS FROM WAVE 3 (2015-2016) OF THE PATH STUDY

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SIGNIFICANCE: Although cigarette smoking is decreasing, Electronic Nicotine Delivery System (ENDS) use is increasing among US adults. There is sparse information on the association of ENDS use and mental health. The aim of this study was to evaluate associations between mental health outcomes and tobacco use. **METHOD:** We used the Population Assessment of Tobacco and Health (PATH) Study Wave 3 adult data. Participants' mental health was evaluated with 2 questions: (1) "In general, how would you rate your mental health, which includes stress, depression, and problems with emotions?" (2) "Compared with 12 months ago, would you say your mental health is now better, worse, or about the same?" We dichotomized the first question as '0 (Excellent/Very Good/Good)' and '1 (Fair/Poor)', and the second question as '0 (Better/Same)' and '1 (Worse)'. We categorized a participant's tobacco use status as cigarette

only user (n=5045), ENDS only user (n=483), dual user (cigarette and ENDS) (n=503), and non-user (n=14,179). Binary logistic regression models were used to assess group associations with each mental health outcome. **RESULTS:** Fair/poor mental health status was reported by 24.2% of cigarette only users, 21.7% of ENDS only users, 22.9% of dual users, and 11.5% of non-users (p<0.001). A worse mental health status compared with 12 months ago was reported by 31.2% of cigarette only users, 19.8% of ENDS only users, 28.3% of dual users, and 16.9% of non-users (p=0.006). After adjustment for age, sex, race, education, and household income, reporting fair/poor mental health was more likely among cigarette only users (odds ratio (OR): 1.85, 95% CI: 1.66-2.07), ENDS only users (OR: 1.93, 95% CI: 1.44-2.59), and dual users (OR: 1.85, 95% CI: 1.46-2.31), compared to non-users. Reporting worse mental health was more likely among cigarette only users (OR: 1.86, 95% CI: 1.59-2.18), ENDS only users (OR: 1.57, 95% CI: 1.11-2.24), and dual users (OR: 2.12, 95% CI: 1.57-2.86), compared to non-users. **CONCLUSION:** Health care providers should be aware that mental health problems are more common among adults who use cigarettes, ENDS, or both product types.

FUNDING: Federal

PS2-153

EDUCATIONAL ATTAINMENT AND E CIGARETTE USE TRANSITIONS AMONG A LONGITUDINAL COHORT OF EXPERIENCED E CIGARETTE USERS

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Significance Educational attainment is one of the strongest predictors of cigarette smoking. Those with less education are considered a vulnerable population due to smoking-related health disparities. As e-cigs gain popularity, characterizing the association between education level and e-cigarette (e-cig) use is equally important in order to understand use patterns and any potential health impacts among this priority population. Methods Experienced e-cig users were invited to complete a baseline online survey from 2012-2015 (T1) regarding their e-cig use and were followed up in 2017 (T2). Continuers were those who reported any e-cig use in the past 30 days at both T1 and T2. Those who reported e-cig use in the past 30 days at T1 but not T2 were considered stoppers. Chi-square tests were used to compare groups by education level (< College degree/ College degree). Results Of those included in the analysis (n=534), 49% (n=261) had < a college degree 51% (n=237) had a college degree. Overall, 86% (n=457) were continuers at follow-up while 14% (n=77) were stoppers. Those with < a college degree were more likely to continue their e-cig use at follow-up (p<0.001) and more likely to be an exclusive e-cig user (p=0.04). Among the continuers, the proportion of dual users (e-cigarette + cigarette) did not differ by education level (p=0.09). Among the stoppers, the proportion of those that quit all tobacco (p=0.32) did not differ by education. Conclusion In a cohort of e-cig users, those with < a college degree were significantly more likely to continue their e-cig use at follow-up. Continued surveillance on educational attainment and e-cig use is important to ensure neither the potential benefits or risks associated with e-cigs disproportionately affect this priority population.

FUNDING: Federal; Academic Institution

PS2-154

HEALTHCARE UTILIZATION AND CANCER SCREENING PARTICIPATION BY SMOKING STATUS, WISCONSIN 2014-2016

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Significance Although cigarette smoking increases the risk of most cancers, there is evidence that people who smoke are less likely to obtain recommended cancer screening tests. Relying on acute services (e.g., emergency room (ER)) for healthcare may contribute to this disparity. We aimed to describe the use of cancer screening services and ER utilization by smoking status (current, former, never), controlling for multiple demographic variables. **Methods** Data were analyzed from 1,726 individuals participating in the Survey of the Health of Wisconsin from 2014-2016, a population-based cross-sectional in-person health examination survey of civilian, non-institutionalized residents of Wisconsin. Relevant survey components included an in-home interview and self-administered questionnaire. Data were weighted to reflect the demographic characteristics of the Wisconsin population, crude odds ratios (ORs) and adjusted ORs were calculated using multiple logistic regression models. **Results** Of 1,726 records analyzed, 15.3% were current-, 25.4% former- and 59.4% never-smokers. Men and women (ages 50-75) who currently smoke were less likely to have routine colonoscopy (\leq every 10 years), compared to never-smokers (45% vs. 80%; OR = 0.16, p<.0001). Women (ages 21-65) who currently smoke were



less likely to have had a PAP smear (\leq every 5 years), compared to never-smoking women (78% vs. 92%, OR = 0.34, $p = 0.02$, and (for women 50-65 years) less likely to have had a mammogram in the past 2 years (72% vs 82%, OR = 0.33, $p = 0.02$). The ORs for pap smear and colonoscopy screening were similar and remained significant for current vs. never-smokers after controlling for potential confounders (age, gender, insurance type, poverty status, education level, use of ER for primary care services and unemployment); adjusted ORs for mammography screening were no longer significant. Current smokers were also more likely than never smokers to report using the ER as their "usual place to go when sick" (12% vs 3%, OR = 1.9, $p = 0.02$), which remained significant after controlling for the variables above.

Conclusions Current smokers in Wisconsin are more likely to use the ER for primary care services, and less likely to obtain regular cancer screening compared to never-smokers, independent of confounders. Considering cigarette smoking is strongly associated with most cancers, and referral for screening takes place in primary care practices, health system quality improvement initiatives should be designed to reduce these disparities.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PS2-155

ASSESSING CONCURRENT USE OF MARIJUANA AND TOBACCO: AN EMERGING ISSUE FOR TOBACCO CONTROL SURVEILLANCE

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Significance: As the landscape of tobacco products continues to evolve and marijuana becomes more widely available for medicinal and recreational use in the U.S., accurately measuring use of both substances is becoming increasingly important. However, there are no standardized measures in population-based surveys for assessing the combined use of marijuana and tobacco, sometimes smoked as a "blunt" or "spliff." This study utilized both a state-based and a national survey to explore the extent to which adult blunt users may under-report tobacco use, and whether this phenomenon varies by select sociodemographic characteristics. **Methods:** Data were from the 2018 Minnesota Adult Tobacco Survey (MATS; N= 6,055) and Wave 3 (2015-2016) of the Population Assessment of Tobacco and Health national study (PATH; N=28,148). Both surveys measured cigar and blunt use among adults. **Results:** Current cigar use was reported by 3.0% (95% CI 2.4-3.7) of Minnesota adults and 6.9% (95% CI 6.6-7.2) of US adults in the PATH study. Current blunt use was comparable in both studies (MATS: 2.1%; PATH: 2.0%). Among current blunt users, 78.5% in MATS and 68.8% in PATH identified themselves as only blunt but not cigar users. Overall, 78.9% and 75.1% of current blunt users aged 18-24 in MATS and PATH respectively, reported blunt use but no cigar use. Females and those with lower education were more like to under-report cigar use than their counterparts. The underreporting of tobacco use overall was 0.7% in MATS and 0.6% in PATH. **Conclusions:** There is a need to accurately assess the use of both marijuana and tobacco products independently and concurrently as current surveys may lead to underreported tobacco use. Survey research should triangulate self-report of combined use to obtain more precise estimates. Accurate prevalence estimates are especially important given increased incidence of tobacco related health disparities experienced by some of the populations most likely to underreport tobacco use. Understanding population estimates of both marijuana and tobacco use has public health implications for addressing both substances.

FUNDING: Unfunded; Nonprofit grant funding entity

PS2-156

DOES DEPRESSION MODERATE THE RELATIONSHIP BETWEEN NEIGHBORHOOD CIGARETTE ADVERTISING AND CURRENT SMOKING?

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BACKGROUND: Point-of-sale tobacco advertising influences smoking behaviors, but little research has examined whether this relationship differs among subgroups, such as individuals with mental health disorders. This study merged ecological data on neighborhood cigarette advertising with geocoded, population-based survey data to assess the association between advertising prevalence in local retailers and current smoking among New

York City (NYC) residents, and whether current depression moderates this relationship. **METHODS:** Store audit data from a stratified, random sample of 796 NYC tobacco retailers generated neighborhood-level prevalence estimates of cigarette advertising, which were linked with unweighted 2017 NYC Community Health Survey data (n=7,837 adult respondents with residential geocodes available). Multilevel regression models accounting for within-neighborhood clustering produced adjusted odds ratios (aOR) of current smoking by level of neighborhood cigarette advertising (in quartiles). Interaction tests and stratified analyses assessed differences in this relationship by current depression status, which was measured in the NYC Community Health Survey using the PHQ-8 scale. **RESULTS:** Smoking prevalence among those with depression (n=728) was 23.7%, significantly higher than among those without depression (n=6672, 11.7%, $p < .0001$). Although no main effect of cigarette advertising prevalence on current smoking existed, the interaction with current depression was significant ($p = 0.045$). Cigarette advertising was only associated with current smoking among those with current depression ($p = 0.023$), not those without ($p = 0.920$). Specifically, respondents with depression who resided in neighborhoods in the highest quartile (Q4) and second quartile (Q2) for cigarette advertising prevalence had higher odds of being current smokers, compared to those living in the lowest advertising quartile [aOR: 1.72 (1.04, 2.86); aOR: 1.94 (1.21, 3.10); respectively]. **DISCUSSION:** While cigarette advertising prevalence was not associated with current smoking status overall, it may serve as an environmental cue to smoke among adults with depression. Efforts to restrict or counteract this practice, such as the development of community-level public health interventions and counter-marketing programs, may particularly benefit those with depression and, perhaps, other mental health disorders.

FUNDING: Federal; Other

PS2-157

TOWARDS A SMOKE-FREE AUCKLAND. EQUITY AND INNOVATION IN LOCAL AUTHORITY POLICY

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Significance: New Zealand (NZ) aspires to become a 'smokefree nation' by 2025, a smoking prevalence of 5% or below, for all. Despite smoking prevalence at 15% overall, stark ethnic and socioeconomic differences persist. Auckland Council, NZ's largest local authority (population 1.6M) has committed to support the national goal. University of Auckland researchers partnered with Hapai, a national Māori community provider organisation, to advise Auckland Council on priority actions for a Smokefree Auckland by 2025. **Methods:** We analysed census data to characterise Māori and Pacific smokers, identified gaps in coverage of cessation services, and searched the literature for interventions showing promise with Māori and Pacific people. We undertook community "listening meetings", inviting Māori and Pacific smokers, ex-smokers, young and old, cessation service providers, vapers and vaping product vendors to share their stories. We analysed these data using thematic analysis, appraising each potential action for evidence of effectiveness, equity impact, technical and political feasibility and acceptability by communities. **Results:** Smoking prevalence in Māori and Pacific people is double that in other ethnic groups in Auckland such that they comprise 40% of Auckland's smokers, concentrated in a handful of areas. Quitting messages are not reaching them and there is confusion around the use and safety of vaping products relative to smoking. Māori and Pacific smokers lack connection with smoking cessation services. Local leadership to reduce the availability of tobacco and smoking is weak. We presented our findings to Council in the form of maps of smoking and as stories, recommending it should: communicate through relevant channels, resource local communities to implement actions; and ensure interventions are evaluated. As a result, Council has invested \$2M in local smokefree action in line with our recommendations. **Conclusion:** Presented with accessible evidence, both quantitative and qualitative, local authorities can act to empower and resource local communities in supporting local tobacco control and cessation support initiatives.

FUNDING: Other

PS2-158

IS YOUR HOME SMOKE-FREE? WHAT ABOUT VAPING? FINDINGS FROM MINNESOTA: 2018

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Significance: Securing clean-indoor-air laws is a major tobacco control accomplishment of the past 15 years. The public quickly adopted and supported such policies both in public and private spaces. Clean indoor air is again threatened by the emergence of e-cigarettes. E-cigarette aerosol contains nicotine, heavy metals, and carcinogens, and the long-term impact of second-hand exposure is unknown. Furthermore, the perception of the harms of e-cigarette vapor is not as well-known as the harms of secondhand smoke. Surveillance is necessary to track voluntary rules regarding smoking and vaping in the home. **Methods:** The Minnesota Adult Tobacco Survey (MATS) is a cross-sectional, random digit-dial telephone survey representative of adult Minnesotans. MATS measured voluntary smoke-free rules in the home in 1999, 2003, 2007, 2010, 2014 and 2018 (N=6,065) and e-cigarette-free rules in 2018. Results are presented as prevalence rates and corresponding 95 percent confidence interval half-widths. **Results:** The prevalence of smoke-free home rules increased significantly from 64.5 ± 2.0 percent in 1999 to 91.5 ± 1.0 percent in 2018. The percentage of smoke-free homes among smokers more than doubled (31.4 ± 4.2 percent to 66.3 ± 4.7 percent) in the same time frame. In 2018, 83.9 ± 1.3 percent of adults reported e-cigarette-free home rules. Significant differences in rules exist across demographic and smoking status subgroups. Only 32.3 ± 7.5 percent of current e-cigarette users report e-cigarette-free homes. **Conclusions:** MATS data show that Minnesotans value clean air. While increases in smoke-free home rules demonstrate positive social norm change, this is challenged with the emergence of e-cigarettes. Tracking voluntary smoke-free and e-cigarette-free home rules is an important component of tobacco control and demonstrates where resources should be directed to improve the public's health.

FUNDING: Other

PS2-159

PACK CHARACTERISTICS OF TOP-SELLING CIGARETTES IN THE US: A MARKET SHARE ANALYSIS

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SIGNIFICANCE: Cigarette packs are influential forms of tobacco marketing that can increase product appeal and implicitly communicate health risks to consumers. This study documented pack characteristics of the top-selling cigarette products in the U.S. and conducted a market share analysis to identify popular packaging features. **METHODS:** The 50 cigarette products with the highest national unit sales in 2018 were identified using Nielsen Scantrack sales data and subsequently purchased in local tobacco retailers. Packs were coded for features such as size, color, text, and promotions. Descriptive analyses, weighted by total unit sales, documented the market share of pack characteristics and examined brand-level differences. **RESULTS:** The packs in the sample constituted over half (59%) of the total cigarette market share. The most common brands were Marlboro (54.6%), Newport (15.5%), and Camel (10.4%). Over two-thirds of packs (65.8%) were "king/standard" size, while 31.6% were larger "100s" style. Almost half of packs (40.1%) contained a color name, the most common being Gold and Silver. Popular text descriptors included "flavor" (38.3%), "smooth" (35.4%), and "mellow" (15.0%). Over half of packs (57.2%) referenced a promotional deal or loyalty program, and this was almost entirely driven by the Marlboro brand. Examples of promotional text included "For special offers, visit Marlboro.com" and "50 cents off." **CONCLUSION:** The top-selling cigarette packs in the U.S. commonly contain features that may influence consumer risk perceptions (e.g., color names, text descriptors). Marlboro, the most popular brand, places rewards program information directly on all of its packs. Regulatory activities that restrict these practices may reduce the appeal of cigarettes to consumers.

FUNDING: Federal

PS2-160

TOBACCO CESSATION TREATMENT-SEEKING AMONG SEXUAL MINORITIES IN THE UNITED STATES

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Significance: Large disparities in tobacco use have been documented, and sexual minorities (e.g., lesbian, gay, and bisexual people) are at particularly high risk for cigarette smoking, tobacco use disorder (TUD), and smoking-related diseases. We examined tobacco cessation treatment-seeking behaviors (e.g., medication, nicotine

replacement products) associated with DSM-5 TUD across three sexual orientation dimensions (identity, attraction, behavior) in U.S. adults. **Methods:** Prevalence estimates were based on data collected from a national sample of the general civilian non-institutionalized population of adults 18 years and older in the National Epidemiologic Survey on Alcohol and Related Conditions III (NESARC-III) (n=36,309). An estimated 2.8% self-identified as lesbian, gay or bisexual, 3.1% had at least one past-year same-sex sexual partner, and 8.3% reported same-sex sexual attraction. **Results:** Regardless of sexual orientation, more than three-fourths of U.S. adults with TUD had never engaged in tobacco cessation treatment-seeking behaviors. Despite having the highest rates of TUD, bisexual men and women had some of the lowest rates of tobacco cessation treatment-seeking. Men who identified as gay or reported same-sex attraction or same-sex behaviors had the highest rates of tobacco cessation treatment-seeking. In contrast, women with same-sex attraction or same-sex behavior had higher rates of TUD but were less likely to engage in tobacco cessation treatment-seeking behaviors than women with only other-sex attraction or other-sex behavior, respectively. Heterosexual women were more likely to engage in tobacco cessation treatment-seeking than heterosexual men; this sex difference was not present among sexual minorities. Medications and nicotine replacement therapy products were the most prevalent forms of treatment-seeking. **Conclusions:** There were notable differences in tobacco cessation treatment-seeking behaviors based on sex and sexual orientation among U.S. adults. Findings suggest that there is a considerable opportunity to reduce cigarette smoking and smoking-related diseases in general, and among sexual minorities more specifically. Findings indicate the underutilization of tobacco cessation treatment-seeking among all adults and highlight important factors to consider when working with sexual minorities who are trying to reduce or stop using tobacco. This abstract was supported by research grants L40DA042452, R01CA203809, R01CA212517, R01DA031160, and R01DA036541.

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PS2-161

ASSOCIATION OF ELECTRONIC CIGARETTE USE WITH POPULATION CIGARETTE SMOKING CESSATION AMONG RACIAL/ETHNIC AND SOCIOECONOMIC STATUS GROUPS IN THE UNITED STATES

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Significance: The association of electronic cigarette (e-cigarette) use with population cigarette smoking cessation is not well studied across race/ethnic and socioeconomic status (SES) groups in the United States, but is important as cessation varies substantially across sociodemographic groups. **Methods:** Data from the annual 2014-2018 National Health Interview Surveys were combined. The analytic sample consisted of recent former (quit <1 year ago) and current cigarette smokers ≥18 years who made a quit attempt in past 12 months (n=14,332). Differences in recent successful smoking cessation (quit <1 year ago) associated with current e-cigarette use vs. non-use (Adjusted Rate Differences, ARDs in % points) were estimated with logistic regression models and predicted probabilities according to race/ethnicity and SES (education level, household income). **Results:** Current e-cigarette users reported a significantly higher rate of recent smoking cessation vs. non e-cigarette users among all races combined (ARD: 5.2%, p<.001) and among non-Hispanic whites (ARD:5.3%, p=.001), but not among race/ethnic minorities (non-Hispanic Blacks: 4.7%, p=.3; Hispanics: 3.5%, p=.4). By education level, recent cessation was significantly higher among e-cigarette vs. non-users for those with > High school (HS) (4.8%, p=0.02) and HS (8.5%, p=.04), but not in those with <HS degree (1.2%, p=.85). By income level, recent cessation was significantly higher among e-cigarette users vs. non-users for those at 200%-399% (6.2%, p=0.007) and 100%-199% (8.3%, p=0.001) of the federal poverty level (FPL), but not high-income (400% of FPL:3.5%, p=.21) and low-income (<100% of FPL: 2.5%, p=.31) groups. Differences in recent cessation associated with e-cigarette use was not statistically significant between race/ethnic (Wald F-test for interaction p-value: 0.86) or SES groups (education level: p=0.86; household-income: p=0.37). **Conclusions:** While recent cessation associated with e-cigarette use was only apparent among socially advantaged groups (whites, higher-educated, medium-income), there were no significant differences across race/ethnic, education, and income groups. Further research is needed to clarify the role of e-cigarettes in contemporary population cessation disparities.

PS2-162

TREATMENT SEEKING BEHAVIOUR AMONG THE URBAN HOMELESS WOMEN SUFFERING FROM TUBERCULOSIS

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Background Tuberculosis is one of the major public health concern among developing countries like India. The deprived population groups are the most vulnerable to tuberculosis morbidities due to their living condition and working condition. There is a limited study on tuberculosis among the homeless women in India. This study attempts to understand the morbidity pattern and the treatment-seeking behaviour among homeless women in India. **Methods** Primary data was collected among the homeless women above 15 years in New Delhi city to understand the risky behaviour and prevalence of TB. The data was collected during July-December 2015. A total of 300 homeless women were interviewed on various issues like causes of homelessness, living condition, substance use and related health issues. Frequency tables, chi-square test, and logistic regression are used to full fill the objectives. **Results** Of 300 homeless women, 36% (108) homeless women are suffering from any tobacco-related morbidities including tuberculosis. About 7.4% among tobacco users are suffering from tuberculosis compared to 1.6% among those tobacco non-users. The treatment-seeking behaviour of respondents was found to be very poor. Nearly half (55 percent) of the homeless women did not seek treatment for the health problem caused by substance use. Among those had morbidity, 23% reported that they sought treatment during the camp organized by NGOs, while 18.5% reported that they had sought treatment from Govt. Facilities. About 11% reported that they had sought treatment from the detoxification center. The multivariate results suggest that those are living in homeless night shelters are more likely to sought treatment for tobacco-related morbidities. **Conclusion** The present study suggests the burden of tuberculosis morbidity and very poor treatment-seeking behaviour among those suffering from this morbidity. The study indicates that living in night shelters have a great impact on taking treatment due to static living arrangements.

FUNDING: Unfunded; Academic Institution

PS2-163

PREDICTORS OF CESSATION FOR PARTICIPANTS IN A RANDOMIZED CONTROLLED TRIAL OF A TEXT-MESSAGING PROGRAM FOR SMOKING CESSATION

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Significance: Identifying predictors of smoking cessation can inform targeted interventions to further increase smoking cessation rates. At present, the literature is inconsistent on the association between socio-demographic factors and cessation. The aim of this study was to identify socio-demographic and smoking characteristics associated with cessation. **Methods:** We conducted a secondary analysis of smokers enrolled in a randomized controlled trial (RCT) of a text-messaging program for smoking cessation (Text2Quit). The primary outcome was smoking cessation at 6-months follow-up, biochemically confirmed as a saliva cotinine level less than or equal to 15 nanograms per milliliter. Participants with missing smoking status were coded as smokers. Baseline demographic predictors included age, gender, education, marital status and race. Baseline smoking predictors included Fagerstrom Test for Nicotine Dependence (FTND) score, number of cigarettes smoked per day, years of smoking, number of past quit attempts and quit attempts in the past 12 months. We conducted simple logistic regressions to explore univariate associations between predictors and the outcome. The multivariate analysis included all predictors and also controlled for treatment arm. A p-value of 0.01 was used to determine statistical significance. **Results:** In the univariate analysis, the only demographic predictor of smoking cessation was female gender [Odds Ratio (OR)=3.43, 95% Confidence Interval (CI): 1.71-6.91, p=0.001]. Smoking related predictors of cessation included FTND score [OR=0.80, 95% CI: 0.71-0.89, p<0.0001] and number of cigarettes per day [OR=0.95, 95% CI: 0.92-0.99, p=0.008]. In the multivariate analysis, only female gender [OR=2.99, 95% CI: 1.46-6.12, p=0.003] and FTND score [OR=0.81, 95% CI: 0.70-0.94, p=0.005] remained significant predictors of smoking cessation. **Conclusions:** Text-messaging programs appear to be a particularly effective smoking cessation approach for women and smokers with low levels of nicotine dependence. Future programs should identify ways to better assist male smokers and smokers with high nicotine dependence.

FUNDING: Federal; Academic Institution

PS2-164

CIGAR SMOKING PATTERNS AND DEPENDENCE BY PRODUCT TYPES AND RACE/ETHNICITY —A NATIONALLY REPRESENTATIVE SURVEY AMONG U.S. ADULTS

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Introduction Racial/ethnic minorities in the U.S. have a high prevalence of cigar use. Little is known, however, about racial/ethnic differences in cigar use patterns and dependence by cigar product types (traditional cigars, cigarillos, and filtered cigars). This research explores whether cigar use patterns (prevalence, frequency, quantity) and dependence differ by product types and race/ethnicity. **Methods** A nationally representative sample of adults (ages≥18 years; N=27,121) from the Wave 3 survey of the Population Assessment of Tobacco and Health (PATH) Study (2015-2016) was used for the analysis. Cigar use patterns included past 30-day use, daily use, cigars per day on days smoked, and past regular use. Cigar dependence was measured by smoking each cigar type within 30 minutes upon waking. Weighted multivariable logistic and linear regressions were used to explore the associations between race/ethnicity and cigar use patterns and dependence, controlling for socio-demographics and past 30-day marijuana use. Models were stratified by three cigar types (traditional cigars, cigarillos, and filtered cigars). **Results** Compared to Non-Hispanic (NH) white adults, NH blacks had greater odds of smoking any cigars in the past 30 days (AOR=1.48, 95% CI=1.30-1.69) and on a daily basis (AOR=2.64, 95% CI=1.89-3.70), smoked more cigars per day (Coef=0.09, 95% CI=0.03-0.14), and had greater odds of past regular use (AOR=2.12, 95% CI=1.87-2.40). This use pattern was generally consistent across various cigar types. Compared to NH whites, although NH blacks had equivalent levels of cigar dependence, Hispanics had greater odds of cigar dependence (AOR=1.47; 95% CI=1.06-2.02), especially cigarillo dependence (AOR=2.12; 95% CI=1.32-3.41). **Discussion** This study found that NH blacks and Hispanics had higher risks of intensive cigar use and cigar dependence across product types, respectively, than NH whites. Preventive and treatment programs are needed to reduce cigar use and dependence among these specific racial/ethnic minority groups. Identification of social and environmental risk factors is warranted to inform future efforts to reduce cigar use-related disparities.

FUNDING: Federal; Nonprofit grant funding entity

PS2-165

LIKING, PERCEPTIONS, AND OPENNESS TO USE FLAVORED VAPING PRODUCTS AMONG NON-USER ADULTS

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Significance: Understanding the basis of flavor appeal and its role in use initiation can inform future regulations of flavored tobacco products. The study objective was to examine flavor liking, perceived harm, and openness to use, among non-user adults. **Methods:** In this pilot internet within subject experiment participants (N=420) viewed, randomly ordered, four flavor names (classic tobacco, cool mint, fresh strawberry, top-shelf bourbon) and rated each on flavor liking (-100 to +100), perceived harm, and openness to use. Analysis of variance and pairwise comparisons were used to examine group differences. **Results:** Of the study sample, 24% and 32% were current and former cigarette smokers, respectively. The majority rated vaping products as equally (64%) or more harmful (20%) than cigarettes. For all tested flavors, the mean values for flavor liking and openness to use were very low. All flavors were rated very high on perceived harm. Significant differences were observed in mean ratings of liking, perceived harm, and openness to use by cigarette smoking status. Positive correlations between liking and openness to use were observed for all flavors (e.g. cool mint: r=.58, n=417, p<.01). **Conclusions:** Findings suggest flavors may not attract adults who do not use vaping products to start using these products.

FUNDING: State; Academic Institution



PS2-166

EXAMINATION OF DIFFERENCES IN SMOKING AND VAPING CHARACTERISTICS BETWEEN LGB AND HETEROSEXUAL INDIVIDUALS

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Cancer health disparities exist among the lesbian, gay, and bisexual (LGB) community, which may be due in part to higher smoking rates. LGB people also have a higher prevalence of electronic cigarette (e-cigarette) use. However, there is scarce information about beliefs and patterns of cigarette and e-cigarette use in the LGB population, and how vaping impacts smoking. In this study, baseline data from a randomized controlled trial testing a smoking cessation intervention for dual users of combustible and e-cigarettes, was used to compare smoking and vaping characteristics among 423 LGB and 2,418 heterosexual participants. Smoking and vaping status 12 months post-baseline were also compared. Given the large number of statistical tests, the Holm method was used to adjust alpha ($p < .001$). Results showed LGB individuals, compared to heterosexuals, had been smoking fewer years ($M=10.7$, $SD=9.9$ vs. $M=13.4$, $SD=11.0$) and smoked fewer cigarettes per day before vaping ($M=17.4$, $SD=9.0$ vs. $M=19.6$, $SD=8.9$). LGB had greater expectancies about cigarettes regarding help with anxiety/worry ($M=6.3$, $SD=1.1$ vs. $M=5.8$, $SD=1.5$), social facilitation ($M=4.2$, $SD=1.9$ vs. $M=3.9$, $SD=1.9$), and stress reduction ($M=5.7$, $SD=1.6$ vs. $M=5.4$, $SD=1.6$). Regarding e-cigarettes, LGB had more positive expectancies regarding taste ($M=6.7$, $SD=0.8$ vs. $M=6.5$, $SD=1.0$) and social facilitation ($M=4.5$, $SD=1.9$ vs. $M=4.1$, $SD=1.9$). The above differences were not significant when controlling for age, sex, education, income, and race. Furthermore, among responders at 12 months ($n=1526$), there were no differences in self-reported 7-day point prevalence abstinence from smoking (37.8% of LGB and 37.8% of heterosexuals), vaping abstinence (27.3% of LGB and 24.8% of heterosexuals) or dual use (43.7% of LGB and 44.6% of heterosexuals). Overall, findings indicate LGB and heterosexual dual users did not differ in their smoking and vaping characteristics independent of demographic differences, and LGB were as likely as heterosexuals to quit smoking 12 months later.

FUNDING: Federal

PS2-167

DO WE HAVE YOUR ATTENTION NOW? AN EYE-TRACKING STUDY OF YOUNG ADULTS' ATTENTION TO E-CIGARETTE ADVERTISING FEATURES

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Normal 0 false false false EN-US X-NONE X-NONE Introduction: Minimally regulated e-cigarette advertising may be one potential factor driving the increasing prevalence of young adult electronic cigarette (e-cigarette) use. The current study examined young adults' attention to e-cigarette advertisement features using eye-tracking to identify what features may be the most appealing to young adults. Changes in perceived harm perceptions of e-cigarettes following advertisement viewing were also examined. Methods: Using a within-subjects design, 30 young adult never e-cigarette users (Age = 20.0 years) viewed 12 e-cigarette ads from three popular brands (blu, JUUL, MarkTen). Ad features were selected to be comparable across brands, and included the following areas of interest (AOIs) included: 1) brand logo, 2) product descriptor, and 3) people. During advertisement viewing, eye-tracking measured participants' dwell time and time to first fixation for each AOI. Participants were also asked about perceived harm perceptions of e-cigarettes before and after viewing the advertisements. Results: Participants spent the longest dwell time and fixated fastest on people within the advertisements, followed by product descriptors, then brand logo (all $ps < .001$). Dwell time by brand was longest for blu, followed by JUUL, then MarkTen ads (all $ps < .001$). Participant sex significantly impacted dwell time of advertisement brand, such that female participants (vs. male) had greater dwell time on JUUL advertisements compared to blu and MarkTen advertisements. Perceived harm perceptions of e-cigarettes significantly decreased after viewing the advertisements ($p < .05$). Conclusions: Young adults may be most drawn to people in e-cigarette advertisements and regulators and policymakers should account for this when formulating marketing restrictions. In addition, results suggest that sex may impact the ways in which individuals

consume e-cigarette advertising perhaps due to the aspirational differences between sexes. As e-cigarette popularity among young adults rises, this study provides preliminary information to health officials and regulators.

FUNDING: Federal

PS2-168

PREVALENCE AND CHANGES IN FLAVORED ECIGARETTE USE ACROSS COUNTRIES FINDINGS FROM THE 2016 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEYS

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Background: Use of flavored e-cigarettes is a public health concern. Currently, there are no studies examining whether use of specific e-cigarette flavors vary across different countries, and whether flavor popularity has changed over time.

Methods: Data are from daily/weekly adult e-cigarette users from Canada (CA), the United States (U.S.), England (EN), and Australia (AU) who participated in Wave 1 (W1) (2016; $n=3,615$) and Wave 2 (W2) (2018; $n=4,499$) of the ITC Four Country Smoking and Vaping Survey. Participants reported their past month use of 12 e-cigarette flavors; multiple flavor users reported their preferred flavor used in the past month. Descriptive estimates assessed prevalence of past month use of each flavor. Within-person changes in past month flavor use was examined among those with data at both waves ($n=1,105$) using weighted logistic regression models.

Results: At W1, the top three flavors were fruit (27.6%), tobacco (25.5%), and menthol (17.3%), which remained the most popular flavors at W2 (fruit=32.7%, tobacco=22.7%, menthol=16.3%). At W1, CA and U.S. e-cigarette users more frequently reported use of fruit flavors than those in EN and AU, whereas EN e-cigarette users more frequently reported use of menthol flavored e-cigarettes ($\chi^2(33)=1749.41$, $p<0.001$). At W2, use of fruit-flavored e-cigarettes was similar across all countries, while use of tobacco and menthol-flavored e-cigarettes remained higher among EN e-cigarette users ($\chi^2(33)=939.28$, $p<0.001$). In adjusted models, change in preferred e-cigarette flavor over time was more likely among those aged 25-39 (aOR: 2.50, 95%CI:1.29-4.80), current daily/weekly cigarette smokers (aOR: 2.86, 95%CI:1.42-5.75), those who recently quit smoking cigarettes (aOR: 2.08, 95%CI:1.06-4.08), and weekly e-cigarette users (aOR: 1.85, 95%CI:1.02-3.34).

Conclusions: In these four countries, fruit, tobacco, and menthol flavorings are popular among e-cigarette users, with differences in flavor preferences occurring across different countries. Age and concurrent cigarette smoking were associated with changes in preferred e-cigarette flavor. Findings have implications for tobacco prevention and cessation efforts.

FUNDING: Federal

PS2-169

SOCIAL MODELING OF VAPING: HOW PREDICTIVE IS IT OF VAPING IN COLLEGE STUDENTS?

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In the past decade rates of e-cigarette use have increased exponentially among young adults. Because of this increase, it is critical that risk factors associated with vaping are identified in order to create successful e-cigarette use prevention programs. Previous research in cigarette smoking has identified social models of tobacco use, including peer use, as predictors of smoking in young adults. However, little research has evaluated social modeling as a predictor of vaping among young adults. Thus, the current study aims to expand research on social modeling as a predictor of vaping on young adults. Participants were college students ($N = 488$) who completed an online survey regarding cigarette smoking and e-cigarette use. Approximately 73% were female, 30.7% Black, 52.9% White, and 7.8% Hispanic/Latino. Students were asked about e-cigarette use among those with whom they had close relationships. For example, participants reported how many individuals that they lived with used e-cigarettes. Vaping among friends was assessed by asking student how many of their five closest friends used e-cigarettes in the last month. Modeling variables were used in logistic regression to predict the following dichotomous outcomes: Ever vaped (any use vs. no use), current vaping (within the last 30 days), and established vaping (vaping at least 100 times). Each additional



roommate who vaped increased the odds of student vaping by approximately 2.5 times (for ever vaping, OR=2.62, $p<.001$; for vaping in the last 30 days, OR=2.43, $p<.001$; for vaping at least 100 times, OR=2.48, $p<.001$). Similarly, each increase in friends who vaped rendered students significantly more likely to use e-cigarettes themselves (for ever vaping, OR=1.93, $p<.001$; for vaping in the last 30 days, OR=1.74, $p<.001$; for lifetime vaping, OR=1.90, $p<.001$). Our results suggest that the having friends and roommates who vape may increase the odds of e-cigarette use in college students. Clearly, longitudinal studies that clarify the direction of causality in the relations between modeling and vaping are sorely needed.

PS2-170

PREFERENCE FOR FLAVOURING AMONG WATERPIPE SMOKING YOUTH IN LAGOS NIGERIA

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Significance: Waterpipe (WP) tobacco use, formally a fad among Arabians is gradually becoming the 'new cool' among youth in many parts of the world. This preference for tobacco as 'shisha' through hookahs or pipes has been on the increase in recent years especially among Nigerian youth. This study sought to explore the reasons for this trend among undergraduates using shisha in Lagos clubs and bars. **Methods:** One hundred and twenty two (122) young male WP smokers aged 19-24 years were surveyed in four tertiary institutions in Lagos, Nigeria to determine their preference in WP tobacco use. Data was analyzed to determine the correlates of willingness to use flavored WP. Results Ninety (74.4%) of the respondents indicated a preference for flavored WP. Increased willingness to use flavored WP was associated with perception as being less harmful (OR=1.54, 95% CI: 1.23-1.71), greater satisfaction (OR=1.44, 95% CI: 1.23-1.68), presence of sweet after smell (OR= 1.11, 95% CI: 1.05-1.47). Decreased willingness was associated with increased cost (OR=0.37, 95% CI: 0.25-0.71) and quick burning time (OR=0.24, 95% CI: 0.11-0.76). **Conclusion:** The relatively high level of willingness to use flavored WP recorded among the respondents suggests that flavoring may be linked to the increased prevalence of WP use among Nigerian youth. This observation may be invaluable in designing interventions.

FUNDING: Other

PS2-171

THE COMBINED ROLES OF SENSATION SEEKING AND EMOTIONAL PROBLEMS IN TOBACCO PRODUCT USE AMONG YOUTH

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Significance: As the ways in which nicotine and tobacco are consumed diversify, developing effective preventive interventions for youth remains a public health priority. Newer products may be particularly appealing to youth with sensation seeking tendencies, a construct successfully employed as a targeted risk factor in substance use preventive interventions; similar interventions can be developed specifically for nicotine and tobacco. An important unresolved question is whether other factors interact with sensation seeking to influence nicotine and tobacco use. Here we examine the role of emotional problems, a risk factor for tobacco use. **Methods:** Data are from youth who enrolled as 10th graders in the Texas Adolescent Tobacco & Marketing Surveillance study. Including only youth whose emotional problem score fell in either the bottom or top third of the distribution at enrollment in 2014, we created four distinct groups (e.g., low emotional problems & high sensation seeking, low emotional problems & low sensation seeking, etc.). We completed χ^2 tests to examine associations between group membership and gender, cigarette, e-cigarette, JUUL, and hookah use in 2018, as well as family and peer cigarette use. **Results:** In 2018, 698 young adults met the inclusion criteria; 52% female, 39% Hispanic, and mean age=17.9 (SD=0.33). Among high sensation seekers with emotional problems 40% reported current cigarette and e-cigarette use, 46% reported JUUL use and 55% reported hookah use. Women disproportionately accounted for the high sensation seekers with emotional problems (47% vs. 29%). A higher proportion of youth reporting as high sensation seekers with high emotional problems have a parent who smokes cigarettes (50% vs. 36%) and a friend who smokes cigarettes (48% vs. 32%). **Conclusion:** These results suggest that youth with high sensation seeking tendencies and more emotional problems are at higher risk for nicotine and tobacco use than peers with fewer emotional problems

and lower sensation seeking tendencies. Characterizing subgroups of high sensation seekers may serve to identify sensation seeking-related norms and attitudes amenable to tobacco preventive interventions.

FUNDING: Federal

PS2-172

IF I SMOKE, I WILL BECOME ADDICTED TO NICOTINE- EXAMINING THE EFFECTS OF ADDICTION MEDIA CONTENT ON THE BELIEF THAT SMOKING IS ADDICTIVE

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Significance: Targeting health risk beliefs is a common tobacco control strategy, dissuading non-smokers from initiating use and encouraging current smokers to quit. One such belief is that smoking leads to nicotine addiction. Youth and young adults (YYA) who endorse this belief are less likely to intend to smoke (OR=0.72; 95% CI 0.67-0.77). In this study, we examine the relationship between addiction media coverage and the belief that smoking leads to addiction. **Methods:** We used crowd-sourced and automated coding techniques to code 'long-form' texts (mass media and website articles) and tweets for explicit references to tobacco addiction from 6/2014-6/2017. Approximately 6% of long-form texts (N=8,477) and 2.7% of tweets (N=1,487,677) mentioned addiction, of which 84.7% (long-form) and 47.6% (tweets) were anti-tobacco. We concurrently conducted a rolling cross-sectional survey of 11,611 YYA (age 13-25; ~75/week) on their beliefs about tobacco addiction. We assessed the impact of past 7-day addiction-related content on the belief that smoking leads to addiction through ordinal logistic regression models clustered by interview date. **Results:** In the main effects model, higher volume of addiction tweets was positively associated with belief endorsement (B=0.15; 95% CI=0.07-0.22). Long-form texts were not significantly associated with belief endorsement. However, the interaction between long-form texts and tweets was positively associated with belief endorsement (B=0.09; 95% CI=0.06-0.12). Oddly, predictive margins indicated that belief endorsement was high when both sources' addiction coverage was low (52%; -1sd) and when both sources' addiction coverage was high (49%; +1sd), but low (43%) when long-form coverage was high (+1sd) and Twitter coverage was low (-1sd). **Conclusion:** We demonstrate that addiction-related tweets were positively associated with YYA addiction belief endorsement; the anomalous interaction between long-form and tweets suggests that addiction tweets may compensate for the negative effects of addiction long-form, particularly when both sources' coverage is high, but is unexplained.

FUNDING: Federal

PS2-173

MULTIPLE TOBACCO PRODUCT USE AND DEPRESSIVE SYMPTOMS IN YOUNG ADULT E-CIGARETTE USERS

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Significance: Youth who use multiple tobacco products concurrently are more likely to suffer from depressive symptoms compared to peers who only use one tobacco product. Given the increasing prevalence of e-cigarette initiation in early adulthood, additional research on the role of e-cigarettes in poly-tobacco product use and depressive symptoms among young adults is needed. **Methods:** An online survey panel was used to collect self-report data on young adult (aged 18-25 years) past 30-day e-cigarette users (n=1,699) during May-July of 2019. Depression was measured with the PHQ-9; respondents with scores of 10 or greater were classified as having clinically meaningful depressive symptoms per recommended scoring guidelines. E-cigarette only users were compared to those who used two tobacco products in the past 30 days (i.e., e-cigarettes plus one additional product; dual users) and those who used three or more products (i.e., e-cigarettes plus two or more additional tobacco products; poly-users). Logistic regression analyses were used to estimate the odds of depressive symptoms across the three groups, adjusting for other substance use, race, ethnicity, gender, sexual orientation, and subjective financial situation. **Results:** The analytic sample included 24.6% current e-cigarette only users, 27.8% dual users, and 47.6% poly-users. After e-cigarettes, the most commonly used tobacco product was combustible cigarettes. Overall, 40.5% of the sample met criteria for depressive symptoms; the prevalence estimates for depressive symptoms among e-cigarette only, dual users, and poly-users were 30.0%, 36.9%, and 48.0%, respectively. Poly-users were more likely to have depressive symptoms compared to both e-cigarette only users (AOR=1.70; 95% CI: 1.28, 2.25) and dual users (AOR=1.32; 95% CI: 1.02, 1.70). **Conclusions:** Poly-users, but



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not dual users, face an increased risk for depressive symptoms compared to those who only use e-cigarettes. Poly-tobacco users remain a high-risk group in young adulthood and warrant distinctive consideration in tobacco control policies. Future research should further characterize differential mental health risks associated with dual and poly-use.

FUNDING: Federal

PS2-174

METHODS OF MEASURING EXPOSURE TO AN ANTI-VAPE MASS-MEDIA CAMPAIGN

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For years, mass-media campaigns been powerful and cost-effective tools for communicating public health messages for the prevention of combustible tobacco use. As media channels have increased and evolved, so too must the methods of evaluating mass-media public health campaigns. Instead of a single television campaign following a 'tent-pole' moment, campaigns can now have multiple targeted messages across differentiated media channels and audiences. Assessing exposure to active campaigns can be a challenge, as evaluators must consider survey length, respondent burden, and the risk of data quality reduction through overuse of survey panels. The purpose of this study is to examine the effect of assessing campaign awareness with a collage of images from all possible ads, replacing the commonly used method of assessing individual ad awareness singly. Data were collected from a national continuous tracking study of young people aged 15-24, with 140 participants per week. Over a six-week period, the sample was split into two aided-recall conditions. In the Individual condition, participants were presented with up to 7 individual images of both current and past ads from a recent campaign. Participants were coded as Exposed to the campaign if they responded that they recognized at least 1 of the individual images shown. In the Collage condition, participants were shown a collage of images from the current ads of the campaign. Participants were coded Exposed if they recognized any imagery within the collage. The results of this experiment showed no significant difference between the conditions in the percent of the sample that reported being exposed to the campaign: 69% of those in the Individual condition and 66% in the Collage condition. Because we know that exposure to anti-tobacco messages is associated with changes in attitudes and a decrease in susceptibility to use tobacco it is important to measure exposure accurately. With no significant difference between the Individual condition and the Collage condition, we conclude that a collage stimulus aids recall just as accurately as individual while reducing survey length and respondent burden.

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PS2-175

RELATIONSHIPS BETWEEN NICOTINE METABOLITE RATIO AND A PANEL OF EXPOSURE AND EFFECT BIOMARKERS: FINDINGS FROM TWO STUDIES OF U.S. COMMERCIAL CIGARETTE SMOKERS

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Significance: To provide a comprehensive picture of a smoker's risk for disease based on the nicotine metabolite ratio (NMR), we examined the influence of NMR on nicotine dependence, heaviness of smoking, and a broad array of tobacco biomarkers of exposure and effect in cigarette smokers. **Methods:** Secondary analysis was conducted on two cross-sectional samples: Wave 1 (2013-2014) of the Population Assessment of Tobacco Use and Health (PATH) study and baseline data from a 2014-2017 randomized clinical trial (RCT). NMR was modeled as a bivariate variable where the lowest quartile of NMR used to distinguish slow from normal/fast nicotine metabolizers. Linear regression was used to assess differences between slow versus normal/fast metabolizers in heaviness of smoking, nicotine dependence, and biomarkers of tobacco specific nitrosamines (TSNAs), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), inflammation and oxidative stress. **Results:** Compared to slow metabolizers, normal/fast metabolizers were heavier smokers as evidenced by greater cigarettes per day and urinary total nicotine equivalents overall and per cigarette smoked. Normal/fast metabolizers had higher levels of urinary biomarkers of TSNAs, VOCs, and PAHs. A novel finding was that normal/fast nicotine had higher levels of some inflammatory

biomarkers when compared with slow metabolizers. **Conclusions:** Normal/fast nicotine metabolizers may be at increased risk for tobacco-related disease due to being heavier smokers, having higher exposure to numerous toxicants and carcinogens, and having higher levels of inflammation when compared with slow metabolizers. Results provide support for the NMR as a biomarker for understanding smoking exposure and for assessment of smoking-related disease risk.

FUNDING: Federal

PS2-176

RISK FACTORS ASSOCIATED WITH PAST 30-DAY USE OF E-CIGARETTES AND COMBUSTIBLE TOBACCO PRODUCTS ACROSS MIDDLE AND HIGH SCHOOL STUDENTS IN TEXAS: LONGITUDINAL ANALYSIS OF THE TATAMS STUDY.

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Significance: The FDA in late 2018 described youth use of e-cigarettes as reaching 'epidemic proportions,' even as combustible tobacco use declined. Between 2017 and 2018, e-cigarette use increased by 78% and 48% among high and middle school students, respectively. Factors uniquely associated with past 30-day use of e-cigarettes and other tobacco products among youth, longitudinally, have not been established. **Methods:** The baseline survey of the Texas Adolescent Tobacco and Marketing Surveillance (TATAMS) study which occurred October 2014-June 2015 (n=3907; N=461,069) and 5 subsequent waves collected every 6 months thereafter were used in this analysis (E-cig: n=3780; Combustible: n=3763). A random intercept logistic regression model was used to examine factors associated with past 30-day use of e-cigarettes and combustible tobacco, across Waves 1-6, while accounting for the correlation of responses from each individual student over time and clustering within schools (E-cig: number of observations (nobs)=14737; Combustible: nobs=14743). Intrapersonal, interpersonal and environmental risk factors were explored based on the Social Ecological Model. **Results:** From 2014-2017, risk factors that were significantly associated with both past 30-day use of e-cigarette and combustible tobacco products over time include past 30-day use of marijuana, social acceptability of tobacco use, peer tobacco use and past 30-day alcohol use. Increasing age, lower grades in school, higher sensation seeking score, recall of social media promotion in the past 30 days, and lower positive affect score were associated with past 30-day use of combustible tobacco only. Risk factors associated with past 30-day e-cigarette use only were male gender, recall of advertising for e-cigarette at stores, White Race (in comparison to Black) and belief that e-cigarette use is a social norm. **Conclusion:** Past 30-day marijuana use, social acceptability of tobacco use, and peer tobacco use had the strongest associations with past 30-day use of both products. These findings underscore the need for proper health education, policy, and other preventive checks as many States have legalized the use of marijuana

FUNDING: Federal

PS2-177

HETEROGENEITY IN CIGARETTE AND E-CIGARETTE DUAL-USE BEHAVIORS AND THEIR ASSOCIATIONS WITH FUTURE TOBACCO HARM REDUCTION AND CESSATION

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Background. Dual-users of cigarettes and e-cigarettes are commonly treated as a single group in behavioral and epidemiological research. Our study applied a more nuanced classification of dual-use to examine associations with future tobacco harm reduction and cessation using data from Waves 1 and 3 of the Population Assessment of Tobacco and Health (PATH). **Methods.** Dual-users at Wave 1 (n=1,665) were categorized into 4 groups based on the frequency with which they used each product (i.e., some days, daily). These groups were *heavy dual-users* (daily smoking and vaping), *predominant smokers* (daily smoking and some day vaping), *predominant vapers* (some day smoking and daily vaping), and *light dual-users* (some day smoking and vaping). Analyses identified demographic correlates of group membership and the prevalence of (1) completely switching to e-cigarettes and (2) quitting both products by Wave 3. **Results.** The majority (69.6%) of dual-users were predominant smokers. Heavy dual-users were less common (14.6%), followed by light dual-users (9.9%). Although predominant vapers were the least common group (5.9%), nearly a quarter of these individuals (22.7%) completely switched to e-cigarettes by Wave 3. Adults who were light dual-users at Wave 1 had higher levels of income and educational attainment and were more likely to completely quit both products by Wave 3 (23.1%). **Conclusions.** Adults who concurrently use cigarettes and e-cigarettes should not be



treated as a single group. Rather, multi-group classification schemes should be applied to precisely describe dual-use behaviors, which are associated with future harm reduction and tobacco cessation. Doing so will ideally lead to more accurate characterizations of the public health impact of dual use.

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PS2-178

E-CIGARETTE USE AND DISPARITIES AMONG ADOLESCENTS

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Introduction. The use of electronic nicotine delivery systems (ENDS; vaping) is on the rise in the US, especially among middle- and high school-age adolescents. **Objective.** Describe the prevalence of ENDS, combustible tobacco, and their dual use among diverse adolescents. Characterize the patterns of tobacco product use by sociodemographic factors and attitudes and beliefs commonly associated with the use of tobacco products during adolescence. **Methods.** A cross-sectional survey in English and Spanish was administered in an urban Title I school district in NJ serving middle and high school students. Parents of pupils in Grades 7, 9, and 11 received an information opt-out letter about the purpose of this research. Homeroom teachers electronically administered the survey via a secure Internet link. Survey preparation and items were modeled after those from the national Youth Risk Behavior Survey. **Results.** Of the approximately 1,350 middle and high school students potentially eligible to participate, less than 5% students' families opted-out. Participation rate was 77% (N=965). The Mean age was 14.8 years, 49% were male, 36% self-identified their race as White and 66% as ethnically Latino, and 16% were born outside of the US. The prevalence of lifetime ENDS use was 19% and 6% for cigarette use; 55% of adolescents were determined susceptible to using ENDS in the future. In multivariable logistic models, 11 graders were >2x more likely to have used ENDS than 7 graders (<.001), students susceptible to future ENDS use were >2-11x more likely to have used ENDS than those who were committed to not using them (<.001), and students who perceived ENDS as being addictive were 59% less likely to have ever tried the products (<.03). After adjusting for the effects of lifetime cigarette use, both higher grade level and higher susceptibility remained significantly associated with the likelihood of having ever tried ENDS. **Conclusion.** Despite their high cost, ENDS use has rapidly expanded into predominantly Latino and urban Title I school districts. Understanding risks and predictors of ENDS use among this population is crucial to preventing and controlling tobacco-related disparities. **Funding.** NIH P01CA200512 and P30CA051008.

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PS2-179

RISK FACTORS FOR CONCURRENT AND SIMULTANEOUS CO-USE OF TOBACCO/NICOTINE AND MARIJUANA

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Significance: Marijuana (MJ) and tobacco or nicotine are often co-used simultaneously (using a product containing both substances or "chasing" MJ with tobacco/nicotine to enhance a high) or concurrently (using both but without mixing or chasing). Physical and psychosocial risks vary by co-use type. For example, simultaneous users tend to smoke cigarettes more frequently than other co-users. However, much of the existing research does not differentiate patterns of co-use or describe their correlates. **Methods:** In 2018, we conducted an online survey of 2,978 adults aged ≥21 living in states with legal recreational MJ. Convenience sample data were calibrated to align with MJ user characteristics from the 2016-2017 Behavioral Risk Factor Surveillance System. We used multinomial logistic regression to examine the association of demographics and frequency of alcohol and tobacco use with co-use type: concurrent-only (C-O; reference group), simultaneous-only (S-O), or both concurrently and simultaneously (C+S). **Results:** Adult co-users were more likely to report C+S co-use (73%) than S-O (19%) or C-O (9%). The most common routes of administration among co-users were blunts (48%), chasing with cigarettes (47%), and chasing with vaped nicotine (33%). Relative to adults aged ≥51, adults aged 21-50 were more likely to be S-O or C+S than C-O co-users. Adults with college degrees versus high school or less education were less likely to be S-O than C-O co-users. Adults who drank occasionally (1-10 vs. 0 days of past 30), smoked cigarettes more frequently (mean 14.2 days of past 30 for C+S vs. 12.9 days for C-O), and vaped nicotine more fre-

quently (mean 5.8 days of past 30 for C+S vs. 4.0 days for C-O) were more likely to be C+S than C-O co-users. Cigar use frequency did not vary by co-use pattern. **Conclusion:** Most surveillance surveys do not distinctly measure simultaneous co-use of tobacco/nicotine and MJ despite its high prevalence. Simultaneous co-use is associated with heavier smoking and vaping, so these co-users may be at greater risk of tobacco/nicotine-related harms. Chasing may be a motivator for tobacco use that has not yet been explored by the tobacco control community.

FUNDING: Federal

PS2-180

SMOKING CESSATION AMONG CANCER SURVIVORS: POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Background: Continued cigarette smoking after a cancer diagnosis is associated with reduced effectiveness of cancer treatment, increased overall and cancer-specific survival and increased risk for a second primary cancer. Whereas smoking cessation is recommended to cancer survivors, a knowledge gap exists in the methods and outcomes of smoking cessation among this population. We examined smoking cessation attempts, methods and their outcomes among US adult cancer survivors who were past-year smokers. **Methods:** We analyzed cross-sectional data from 565 adult cancer survivors who were past-year smokers in Wave I (2013-2014) of the nationally representative Population Assessment of Tobacco and Health (PATH) Study. We assessed the methods used among those who had a quit attempt in the past year. Cessation methods include evidence-based behavioral treatments and medications as well as e-cigarettes. Logistic regression examined the association between cessation methods used and successful quit attempts, adjusting for sociodemographics, geographic region, smoking history, time since diagnosis, social support, and insurance status. **Results:** Among cancer survivors, 53% were aged 45-64 years, 66% were female, and 83% were non-Hispanic white. A total of 331 cancer survivors tried to quit in the past year (57%). Among them, 50% reported unassisted attempts, 23% used medication only, 13% use e-cigarettes only, and 7% used medications and e-cigarettes. Among those who successfully quit (n=45), 56% had unassisted attempts, 18% used medication only, 11% used e-cigarettes only, and 9% used both medications and e-cigarettes. Those who used approved cessation medications had higher odds of success (adjusted odds ratio, 3.77, 95% confidence interval, 1.04-13.68). **Discussion:** Among adult cancer survivors who smoke, slightly more than half had a quit attempt in the past year. Approved medications were more likely to be utilized than other cessation methods and showed a strong association with successful quit attempts. Approved cessation medications should be considered when offering tobacco treatment to cancer survivors.

FUNDING: Academic Institution

PS2-181

"10000 LIVES", A TARGETED REGIONAL SMOKING CESSATION CAMPAIGN IN AUSTRALIA

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Significance: The prevalence of daily smoking is higher in Central Queensland (CQ), Australia compared to the State and National averages. To reduce the daily smoking rate of CQ from 16.7% to 9.5% by the year 2030 (i.e., 20,000 fewer smokers and saving 10,000 lives from premature death), CQ Public Health Unit with the support of CQ Hospital and Health Service (CQHHS) launched a smoking cessation campaign called "10000 Lives" in November 2017. **Methods:** We have conducted an exploratory investigation for the evaluation of "10000 Lives", using information from the field notes, project documentation notes, policy documents and from interviews with project staff. We compared the volume of calls to "Quitline" from the CQ region in the 14 months before (September 2016 to October 2017) and 14 months after (November 2017 to December 2018) the campaign launched. The study is approved by the CQHHS Human Research Ethics Committee. **Result:** Since launching, the "10000 Lives" project officer has conducted two tobacco control summits in two consecutive years in Central Queensland, bringing together experts from across Queensland. There have been three smoking cessation workshops for clinical and community champions in partnership with Queensland Health and Cancer Council. Health promotion activities have included radio promotion of World



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No Tobacco Day, a film competition with youth and a Facebook page for promoting smoking cessation in Central Queensland. In addition, six hundred and seventy newly recruited staff of CQHHS were provided education on smoking cessation activities including the referrals to "Quitline". Three hundred clinical staff have been upskilled for utilisation of the smoking cessation clinical pathway and how to refer to "Quitline". Between November 2017 and December 2018, 3,826 CQ smokers called Quitline compared to 2,288 calls in the preceding 14 months of the pre-campaign period. This represents a significant rise (67.2%) in the volume of mean monthly Quitline calls during the post-campaign period; pre-campaign calls: 163.4 /month [95% CI, 127-199.8] vs post-campaign calls: 273.3/month [95% CI, 253-293.5] ($p < 0.0001$). **Conclusion:** The "10000 Lives" is an example of a program where coordinating the smoking cessation activities in a regional area by harnessing and improving awareness of existing resources (e.g. employing only one project officer) can impact on the use of "Quitline", and subsequent quit attempts. Finding cost-effective ways to reduce smoking prevalence in regional areas is needed in resource-tight environments.

FUNDING: Unfunded; Academic Institution

PS2-182

DUAL USE OF TOBACCO PRODUCTS AND MENTAL HEALTH AMONG KOREAN ADULTS

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Significance: This study aimed to compare the mental health of dual users of electronic cigarettes (E-cig) and cigarettes with those of cigarette-only smokers in Korean adults. **Methods:** This cross-sectional study was based on the data acquired from the 6~7th Korean National Health and Nutrition Examination Survey (2013-2017). A total of 28,062 participants aged 19 years and older were enrolled and categorized into four groups: ever dual users ($n=1,776$, 6.3%), ever E-cig use only ($n=66$, 0.2%), ever cigarette-only smokers ($n=8,668$, 30.9%), and never users of any tobacco products ($n=17,562$, 62.6%) in their lifetime. The data were analyzed by complex-samples analyses and multivariate logistic regression analyses were used to determine the relationship of tobacco use behavior with mental health after adjustment for potential confounders. **Results:** Dual users or E-cig users were relatively younger than no users or cigarette only users (36.8 ± 0.3 , 37.1 ± 2.3 , 46.0 ± 0.2 , and 49.7 ± 0.2 , respectively). Dual users had poorer mental health indicators, including higher stress awareness, the continuous depressive mood for more than 2 weeks, more common suicidal ideas during the past year, higher PHQ-9 scores, and doctor-diagnosed depression than cigarette-only smokers or never users of any tobacco products. The adjusted odds of high-stress awareness were higher among tobacco use only group (OR, 1.55; 95% CI, 1.40-1.73) or dual-use group (OR, 1.92; 95% CI, 1.64-2.25) compared to no users group. Similar results were found in indicators such as depressive mood, suicidal ideation, and doctor-diagnosed depression. Also dual users group had higher ORs of stress awareness (OR 1.24; 95% CI, 1.06-1.44), depressive mood (OR 1.81; 95% CI, 1.27-2.57), and doctor-diagnosed depression (OR 1.46; 95% CI, 1.02-2.09) compared to cigarette-only users group. **Conclusion:** Dual users had poorer mental health than cigarette-only smokers or no users. Nicotine dependence may play a role in this finding and more attention should be paid to the dual users of tobacco products. In other aspects, these findings may justify the regulations on the various types of electronic cigarettes.

FUNDING: Unfunded

PS2-183

WHY JUUL- REASONS FOR JUUL USE AMONGST YOUNG PEOPLE IN THE UNITED STATES

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Significance: The JUUL nicotine salt pod vaporizer is one of the most widely used e-cigarettes within the United States and has been described by the Surgeon General as being behind the epidemic in youth e-cigarette use. This presentation will outline the appeal, and reasons for use, amongst a sample of young people in the U.S. who reported last 30 day JUUL use. **Methods:** Online survey of 492 young people (age 13 to 17) in the U.S. who reported having used a JUUL in the last 30 days. **Results:** Amongst youth who had never smoked, the main reasons for JUUL use had to do with its popularity and use by friends (54.2%), the ability to hide the device (52.5%), and the availability of different flavors (49.2%). Amongst current smoking youth the main reasons for JUUL use had to do with its ease of use (52.1%), flavor variety (46.8%), its acceptance by peers (41.9%). Nicotine hit and reduced harm was mentioned only by a third of current smokers (32.6%, 33.3%). Amongst former smoking youth the

most frequently cited reason for JUUL use had to do with the ease of hiding the device (52.6%), flavor variety (48.5%), use with friends (45.9%). **Conclusions:** Reducing the appeal of JUUL to young people will require developments that make the device less easy to hide, less socially acceptable amongst peers, and more closely tied to the issue of relative harm compared to combustible cigarettes. Emphasis should also be given to the nicotine content of JUUL pods since this was an item that was much less prominent in young peoples reasons for JUUL use.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS2-184

ASSOCIATION BETWEEN JUUL AND OTHER E-CIGARETTE USE AND FUTURE COMBUSTIBLE CIGARETTE USE - EVIDENCE FROM A PROSPECTIVE COHORT OF YOUTH AND YOUNG ADULTS 2017-2019

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A surge in popularity of e-cigarettes among young people in the US prompts concern given the association between e-cigarette use and future cigarette use. However, much of the evidence for this association comes from studies that measure baseline e-cigarette use before the release of JUUL, a pod-mod system that quickly captured more than 70% of the e-cigarette market. The goal of this study was to examine the association between JUUL and other e-cigarette use at one time point and future cigarette use among a nationally-representative, longitudinal cohort of young people. Participants in this study included members of a probability-based, longitudinal panel of youth and young adults, ages 15-27 years, who reported never use of a nicotine product, electronic or combustible, in early 2017. E-cigarette use and JUUL use, as well as combustible tobacco use was measured 12 months and 24 months later. Logistic regression analyses assessed associations between participants e-cigarette and JUUL use in 2018 and future cigarette use in 2019 after controlling for demographic and psychosocial variables. Compared with those who had never used an e-cigarette, those who used an e-cigarette (other than JUUL) between 2017 and 2018 had significantly higher odds of later trying a cigarette between 2018 and 2019 ($aOR=6.98$, $a < .001$) and significantly higher odds of being a current cigarette smoker in 2019 ($aOR=6.48$, $a < .001$). Compared to those who had never used an e-cigarette, those who reported they had ever used a JUUL, also had significantly higher odds of having tried a cigarette ($aOR=7.53$, $a < .001$) and of being a current smoker in 2019 ($aOR=7.93$, $a < .001$). Additionally, JUUL use in 2018 was associated with 18.6 times higher odds of being a current JUUL user in 2019, whereas e-cigarette (other than JUUL) use in 2018 was associated with 9.9 times higher odds of being a current e-cigarette (other than JUUL) user in 2019. The significant positive association between e-cigarette use generally, and JUUL use specifically, and future cigarette use suggests e-cigarette use, including JUUL, prompts initiation of a dangerous combustible product. Additionally, any use of JUUL is highly predictive of future continued JUUL use. Strong regulation of all nicotine products, including e-cigarettes, is needed to prevent the trajectory of e-cigarettes to cigarette use among youth and young adults.

FUNDING: Other

PS2-185

SMOKING URGES, TIME TO FIRST CIGARETTE AND NICOTINE EXPOSURE IN ADULT DEPENDENT SMOKERS

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Aims: The urge to smoke is a defining characteristic of nicotine addiction. The time to first cigarette (TTFC) after waking is a widely used measure of the severity of dependence and a strong predictor of nicotine uptake. The current study determines the relation between the timing and intensity of subjective cravings to smoke and both TTFC and biomarkers of nicotine exposure. **Design:** Data from the Pennsylvania Adult Smoking Study (PASS) of 353 adult smokers was used to examine the relationship between urges to smoking in the morning versus urges to smoke in general and TTFC. Data were analyzed using multiple mediation and bootstrapping methods with bias-corrected confidence intervals and hierarchical linear regression. Smokers completed items from the Consensus Measures of Phenotypes and Exposures (PhenX) toolkit, and saliva collection for nicotine metabolites. **Findings:** There was a strong dose-response relationship between increasing urge to smoke in the morning and both shorter TTFC and increasing number of cigarettes per day. Findings suggest that urges to smoke in the morning, but not urges to smoke in general, was associated with higher cotinine levels, an effect that was partly mediated by TTFC. Additionally, urges to smoke in the



morning, but not urges to smoke in general, had a significant direct effect on the TTFC. In addition to a direct effect on TTFC, urges to smoke in the morning had a significant indirect effect on time to first cigarette, partially mediated by the number of cigarettes smoked per day. The relation between urges to smoke and TTFC was not mediated by overall nicotine addiction scores. **Conclusions:** The urge to smoke in the morning, but not urges to smoke in general, appears to be an important independent trait that characterizes nicotine addiction and uptake and furthers clarifies the relation between cravings and addiction, particularly as measured by TTFC.

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PS2-186

IMPACT OF MENTHOL DELIVERY METHODS ON SMOKER SENSORY PERCEPTIONS

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Significance: Menthol can be added to cigarettes in the tobacco, via a crushable capsule in the filter, or the combination of these methods. Different delivery methods of menthol may lead to changes in sensory attributes, as well as perceived risk and appeal of these products. **Methods:** Using a randomized, controlled study design, eighteen current, established menthol smokers were asked to sample Camel Crush and Camel Menthol cigarette products, crushed and uncrushed, and provide subjective ratings. **Results:** The average Cigarette Evaluation Scale relief score of participant's preferred brand was significantly higher than that of Camel Menthol crushed ($p=0.012$). Furthermore, the average Sensory Scale satisfaction score of the participant's preferred brand was significantly higher than mean satisfaction score for Camel Menthol crushed ($p=0.004$). In addition, the average Sensory Scale smoke strength scores of participant's preferred brand was also significantly higher than Camel Crush crushed ($p=0.022$). These differences were likely due to the participants' familiarity with their preferred brand. Finally, there were no significant differences in smoking topography measures, CO boosts, or perceived risk between Camel Crush or Camel Menthol products. **Conclusion:** Various delivery methods of menthol do not seem to impact sensory perceptions, perceived risk, or smoking behavior among current adult smokers of mentholated cigarettes. This suggests that consumers may be attracted to the innovative technology of the crushable filter capsule, which may stimulate experimentation with smoking and push for the regulation of capsule cigarette products.

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PS2-187

ARE STATE-LEVEL SOCIOECONOMIC DISPARITIES IN ADULT SMOKING DECLINING?

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Significance: Reducing income-based disparities in smoking is a priority for tobacco control in the United States (US). This study examined prevalence and recent trends in current cigarette smoking in each state and the District of Columbia by self-reported annual household income. To our knowledge, this is the first state-based analysis to examine recent trends in income-based disparities in the US. **Methods:** Data came from the Behavioral Risk Factor Surveillance System (BRFSS), a state-representative survey of non-institutionalized US adults ages 18 years and older. We fit logistic regression models to examine linear time trends in cigarette use in each state between 2011 and 2017. **Results:** In each state, the odds of smoking were 1.4 to 2.2 times greater in the lower-income group as compared to the higher-income group. Among 44 states, linear time trends in smoking over time in both lower- and higher-income groups did not differ ($p > .05$), suggesting no change in income-based disparities in smoking. In five states (Maine, Missouri, Montana, North Dakota, West Virginia) disparities widened, primarily because smoking prevalence only dropped among higher-income groups. Disparities declined in only two states. In New York and Washington, smoking prevalence declined more for lower-income groups compared to higher-income groups. **Conclusions:** All states exhibited income-based disparities in smoking. Despite being a priority, only two states have made progress in reducing income-based disparities in smoking between 2011 and 2017. In five states disparities have widened. Novel pro-equity strategies are urgently needed because current tobacco control efforts, while reducing cigarette smoking overall, are maintaining or widening income-based disparities.

FUNDING: Federal

PS2-188

COMPARISON OF GENERAL AND SPECIFIC MEASURES OF E-CIGARETTE HARM PERCEPTIONS

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Significance: Tobacco product risk and harm perceptions have been associated with tobacco use, and as such, tobacco risk measures are frequently included in research studies. However, these measures are often asked in a general way. Although some studies and reports have recommended the use of more specific wording on tobacco risk perception measures, limited research exists comparing the results of different wordings. We present exploratory data comparing responses to a general and more specific measure of e-cigarette harm perceptions. **Methods:** We conducted an online survey with 1006 young adults ages 18-29 recruited through TurkPrime's Prime Panels in January 2019. All participants responded to a general e-cigarette harm perception measure ("How harmful, if at all, do you think vaping/using an e-cigarette is to a user's health?") and a more specific version of the measure ("Imagine you vaped/used e-cigarettes daily for the next 10 years and used no other tobacco product. How harmful do you think this vaping would be to your health?") that personalized the behavior/harm and presented a specific use condition and timeframe. Both measures used the same 5-point response scale (not at all-extremely harmful). Descriptive statistics are presented. **Results:** More participants rated e-cigarettes as very or extremely harmful using the specific (51.6%) versus the general (43.9%) measure. Differences were higher for non-smokers versus smokers. While most participants (64.6%) provided the same harm rating to both measures, 23.1% provided a higher harm rating to the specific measure. Smoking status was not significantly associated with rating consistency. Correlations between each harm perception measure and a measure of intention to use e-cigarettes in the next 6 months were similar ($r = -0.42$ general; $r = -0.43$ specific). **Conclusions:** The results of more specifically worded harm perception measures may be more interpretable and may result in different estimates than more generally worded measures. Additional research on best practices for tobacco risk perceptions measures, including those pertaining to e-cigarettes, is needed.

FUNDING: Federal; Academic Institution

PS2-189

CHILDHOOD ADVERSITY AND TOBACCO USE DURING THE TRANSITION TO COLLEGE: THE ROLE OF SELF-CONTROL AND PURPOSE

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Introduction: Childhood adversity, which involves negative/traumatic life events experienced early in life, is associated with increased cigarette and smokeless tobacco (SLT) use. Two factors that may protect against tobacco use after adversity are self-control and sense of purpose. Both are associated with lower levels of tobacco use and offset individuals' risk for engaging in other negative health behaviors in response to early negative experiences. **Purpose:** To 1) examine the role of childhood adversity on lifetime use of cigarettes, electronic cigarettes (ECIGs), and other tobacco products (i.e., cigars, hookah, and SLT aggregated) and 2) determine whether self-control and sense of purpose moderate the associations between childhood adversity and lifetime tobacco use. **Methods:** Participants were 578 incoming freshmen in 2016 from a large mid-Atlantic university ($M_{age} = 18.1$, $SD = 0.9$; 89.4% White; 69.6% female). They completed surveys assessing childhood adversity, self-control, sense of purpose, and lifetime use of tobacco products. **Results:** Individuals who experienced greater adversity (e.g., death of parent, lack of parental education, difficulty paying bills when growing up) were at increased odds for using cigarettes and ECIGs compared to individuals with less adversity. Importantly, individuals with greater adversity were at increased odds for using cigarettes only when they had low self-control. Although sense of purpose moderated the association between adversity and ECIG use, purpose did not buffer the likelihood of ECIG use at high levels of adversity. However, among individuals with low levels of adversity, individuals with a greater sense of purpose were less likely to use ECIGs than were individuals with a lower sense of purpose. **Conclusions:** Findings highlight the protective role of certain psychological factors (i.e., self-control) on the likelihood of using cigarettes after experiencing early life adversity, but also point to the long-lasting effects of childhood adversity on ECIG use. Findings can be used to inform intervention efforts tailored to reducing tobacco use among individuals who have experienced childhood adversity.

FUNDING: Federal



PS2-190

EFFECTS OF SOCIAL MEDIA ON ADOLESCENTS' WILLINGNESS AND INTENTION TO USE E-CIGARETTES

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Introduction: This study examined effects of experimentally manipulated social media exposure on adolescents' willingness and intention to use e-cigarettes. **Methods:** Participants were 135 adolescents age 13-18 (52.6% female, M age=15.3) in California. Participants viewed 6 social media posts online in a 2 (post source: peer or advertisement) X 2 (e-cigarette content exposure: heavy or light) between-subjects design. Analyses were weighted to population benchmarks. We examined adolescents' beliefs, willingness, and intention to use e-cigarettes in association with social media use intensity in daily life and with experimentally manipulated exposure to social media posts that varied by source (peer or advertisement) and content (e-cigarette heavy or light). **Results:** Greater social media use in daily life was associated with greater willingness and intention to use e-cigarettes and more positive attitudes, greater perceived norms, and lower perceived danger of e-cigarette use (all p -values<.01). In tests of the experimental exposures, heavy (versus light) e-cigarette content resulted in greater intention ($p=.049$) to use e-cigarettes and more positive attitudes ($p=.019$). Viewing advertisements (versus peer-generated posts) resulted in greater willingness and intention (p 's<.01) to use e-cigarettes, more positive attitudes ($p=.003$), and greater norm perceptions ($p=.009$). The interaction effect of post source by post content was not significant for any of the outcomes (all p -values>0.529). **Conclusions:** Greater social media use and heavier exposure to advertisements and e-cigarette content in social media posts are associated with a greater risk for e-cigarette use among adolescents. Regulatory action is needed to prohibit sponsored e-cigarette content on social media platforms used by youth.

FUNDING: Federal; State; Nonprofit grant funding entity

PS2-191

PERSONALITY AND IMPULSIVITY AS PREDICTORS OF TOBACCO USE AMONG YOUNG ADULTS: A LATENT CLASS ANALYSIS

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Introduction: Both tobacco and electronic cigarette (ECIG) industries have specifically marketed their products toward young adults (aged 18-29), with the goal of increasing tobacco use among this age group. Thus, in order to inform prevention efforts, researchers are exploring ways to understand not only how demographic factors predict initiation, but also how key psychological traits are involved in tobacco use patterns. **Purpose:** Identify classes of young adult tobacco users via latent class analysis (LCA) and determine whether the Big Five personality characteristics and/or impulsivity predict class membership above demographic factors. **Methods:** Participants were 578 incoming freshmen in 2016 from a large university in a mid-Atlantic state ($M_{age}=18.13$, $SD=0.94$; 89.43% White; 69.62% female). They completed surveys assessing demographics, personality, impulsivity, lifetime use of cigarettes and ECIGs, and current use of cigarettes, ECIGs, cigars, and smokeless tobacco. **Results:** LCA classified participants as *Nonusers* (66%), *Polytobacco Users* (4.1%), *Experimenters* (25.6%), and *Cigar Users* (4.3%). *Polytobacco* and *Cigar Users* included higher proportions of males and participants of lower socioeconomic status relative to *Nonusers*. Regarding Big Five personality characteristics, individuals with lower Agreeableness, lower Conscientiousness, and higher Openness were more likely to be in classes associated with current tobacco use (*Cigar* or *Polytobacco Users*) and less likely to be *Nonusers* or *Experimenters*. Similarly, for impulsivity, those scoring lower on sensation seeking and negative urgency were more likely to be *Nonusers*. **Conclusions:** Consistent with research on cigarette smoking, these findings highlight that distinct types of young adults belong to each tobacco use class. This suggests that individual differences be incorporated in the design and delivery of prevention efforts since those factors related to personality and impulsivity have proven amendable to change. It also follows that regulators and policy makers consider prevention strategies that offer components tailored toward such factors.

FUNDING: Federal

PS2-192

A QUALITATIVE INVESTIGATION OF HOW FOOD INSECURITY INFLUENCES CIGARETTE SMOKING BEHAVIOR

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Background: Food insecurity is a stressful condition due to inconsistent food access, and disproportionately impacts lower-income groups. Epidemiological studies show that cigarette smoking prevalence is high among people experiencing food insecurity, and numerous studies also show that food insecurity and cigarette smoking operate as risk factors for one another. However, there is limited understanding of the association from a qualitative perspective. We conducted in-depth interviews to understand the experience of food insecurity in relation to smoking behavior. **Methods:** We targeted participants living throughout Western Massachusetts. Participants aged 21+ were recruited through contact lists from previous studies, and through flyers and advertisements. Eligibility criteria included (1) either current tobacco smoking (smoked 100+ cigarettes in lifetime, and currently smokes every day or some days) or former tobacco smoking (ever smoked, with last puff within past 3 years), and (2) self-reported past-year food insecurity using a 2-item screener. Participants were interviewed via telephone. Interviews were audio-recorded and transcribed. **Results:** We interviewed 31 participants (ages 26-68, 22 women), of whom 22 were current smokers. Participants discussed the experience of food insecurity as a prominent stressor that occurs alongside housing, employment, and transportation insecurity. Emergent themes included (1) smoking as a replacement for food and meals; (2) prioritizing and balancing cigarette purchases alongside tight food budgets; (3) various strategies used to access cigarettes on a limited budget, such as traveling out-of-state, and switching to roll-your-own cigarettes; and (4) difficulty in managing appetite and food cravings during quit attempts. **Conclusions:** The current findings highlight that food insecurity and resultant stress and hunger can reinforce smoking behavior, while smoking in turn can exacerbate food insecurity. Findings from this investigation underscore the need to address socioeconomic stressors towards developing effective strategies and interventions to reduce the high prevalence of smoking in people experiencing food insecurity.

FUNDING: Federal

PS2-193

TRENDS AND CORRELATES OF MISPERCEPTIONS AND UNCERTAINTY OF ELECTRONIC CIGARETTE HARMS COMPARED WITH CIGARETTE SMOKING AMONG US ADULTS, 2015-2018

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Background: Recent media coverage of vaping risks, scrutiny over JUUL Labs' marketing to youth, and e-cigarette regulations may have contributed to public misperceptions of harms of e-cigarette use relative to cigarette smoking. This study examines trends and correlates of public misperceptions and uncertainty of harms from using e-cigarettes versus combustible cigarette smoking between 2015 and 2018. **Methods:** Data were analyzed from the Health Information National Trends Survey (HINTS-FDA Cycles 1 and 2 in 2015 and 2017 and HINTS 5 Cycle 2 in 2018; N=8669) among US adults 18 years and older. Perceived harm of using e-cigarettes compared with smoking cigarettes was categorized as 1) less harmful, 2) just as or more harmful, and 3) don't know. We analyzed the weighted prevalence of each category from 2015-2018. We utilized weighted multinomial logistic regression with survey year as a predictor of perceived harm (referent outcome is much less or less harmful), adjusting for age, sex, race/ethnicity, education, and cigarette smoking status. **Results:** Fewer US adults perceived e-cigarettes were less harmful than smoking in 2018 (17.4%) than in 2015 (26.3%). Conversely, more US adults perceived e-cigarettes were just as or more harmful than smoking (44.2% vs. 38.1%) and more reported they don't know (38.5% vs. 35.6%) in 2018 than 2015. Participants in 2018 (vs. 2015) were more likely to perceive using e-cigarettes were just as or more harmful than cigarettes (RRR[95% CI]=1.6 [1.3, 2.1]) and report they don't know (RRR[95% CI]=1.5 [1.2, 1.9]) than to perceive e-cigarettes as less harmful than smoking cigarettes. Older age, being female, racial and ethnic minorities, and being a former or never smoker were associated with perceiving e-cigarettes as just as or more harmful than smoking or reporting they don't know. **Conclusion:** Public misperception and uncertainty of e-cigarette harms relative to smoking cigarettes increased between



2015 and 2018. Research is needed to describe sources of misinformation related to e-cigarettes, examine effects of misperceptions on cigarette and e-cigarette use among current smokers, and develop best approaches to correct misperceptions.

FUNDING: Unfunded

PS2-194

REACTANCE TO THE MESSAGE IS ELICITED BY PRO-VAPING ADS THAT CONTAIN ANTI-SMOKING ARGUMENTS

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SIGNIFICANCE: Many electronic nicotine delivery system (ENDS) advertisements contain anti-smoking messages. These messages may elicit reactance, which reduces anti-smoking message effectiveness through source derogation and counterarguments to the message, and may lead to pro-smoking beliefs and behaviors. Many ENDS advertisements also contain images of vapor, which may look similar to cigarette smoke. Because of this similarity, ENDS ads that contain vapor may increase reactance in viewers. This study investigates whether 1) ENDS ads elicit reactance compared to control messages, 2) vapor elicits reactance, and 3) ENDS messages that contain anti-smoking arguments elicit reactance. **METHODS:** Young adults (18-30; mean age=22.5, SD=2.3) were recruited from a community research pool (N=165) and randomly assigned to one of three conditions (ads with vapor, ads without vapor and a beverage consumption control condition) each of which contained 7 ads (approximately half containing anti-smoking messages) of 30 seconds each. Measures were: angry affect (3-item; alphas from .87-.96 per message), perceived freedom threat (4-item; alphas from .67-.81) and counterarguing (3-items; alphas from .68-.93). In the past 30 days, 34% were non-users, 6% smoked only, 30% vaped only and 27% were dual users. **RESULTS:** A regression analysis found that participants in the ENDS conditions described experiencing more freedom threat (vapor Coef=0.31, $p=0.039$, no-vapor Coef=0.35, $p=0.024$), anger (vapor Coef=0.88, $p<0.001$, no-vapor Coef=0.73, $p<0.001$) and counterarguing (vapor Coef=0.58, $p=0.008$, no-vapor Coef=0.53, $p=.004$) than in the control condition. In independent sample t-tests there were no significant effects of vapor on reactance outcomes. Paired sample t-tests found that messages that contained anti-smoking arguments elicited more reactance across measures than those that did not ($p<0.01$ for all tests) ($t_{threat}(df=56)=5.92$, $t_{anger}(df=56)=3.78$, $t_{counter}(df=28)=4.92$). **CONCLUSION:** Generally, pro-vaping messages elicit more reactance than beverage-related advertisements. This may be caused by the presence of anti-smoking arguments, which generally elicited greater reactance. Pro-vaping messaging with anti-smoking content may require additional study, to determine the broader effect of reactance in this context.

FUNDING: Federal

PS2-195

RACIAL DIFFERENCES IN VAPING BELIEFS AND BEHAVIORS

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Significance: Previous research has shown that in the U.S., Black individuals are more likely than White individuals to suffer the health consequences of tobacco, even though they make more frequent attempts to quit smoking. Black individuals have historically been targeted by tobacco companies in a variety of ways (i.e., increased number of ads, tobacco retailers in communities with large Black populations, companies making financial contributions to minority educational institutions). Recently, there has been a rise in vaping among the general population, but it remains unclear if there are racial differences in vaping. **Methods:** The current study was designed to assess whether White and Black individuals differ in their 1) use of vapes, 2) ages of first use (among vapers only), and 3) beliefs about vaping (compared to cigarettes) and harm related to vape flavors. At a mid-South university, 406 students completed an online survey of cigarette and vape use for course credit. Participants were 30.5% Black, 69.5% White, and 73.2% female, with a mean of 20.6 years of age ($SD=5.1$). Vapers and non-vapers responded to questions pertaining to beliefs about vaping compared to cigarettes. **Results:** Results indicated that White students were significantly more likely to have ever vaped, vaped 100 times, or vaped in the last 30 days. Black students initiated vaping at an older age than did White students, $F[1, 404] = 4.03$, $p = .05$. White students were more likely to report that vaping is less harmful than smoking cigarettes because vapes do not contain nicotine ($p = .024$) and that vaping is organic ($p = .001$). Black students were more likely to report believing that vaping is less harmful than cigarette smoking because there is no tobacco combustion ($p = .02$) and that vapes contain only nicotine ($p < .0001$). Black students were also more likely to believe that vaping aids

smoking cessation ($p < .0001$), and that menthol, candy, fruit, chocolate, other sweets, and mixed vape liquid flavors pose slight or moderate levels of risk to health ($p < .05$), compared to no risk. **Conclusions:** These results indicate differences in communication about vaping among different racial groups. Black students are more likely to endorse beliefs that vaping flavors are harmful than White students, who were more likely to endorse incorrect beliefs about vaping (i.e., it is organic). White students may be more at-risk among college populations compared to Black students. Further research among other age groups is recommended given that Black individuals are more likely to start vaping use at a later age.

PS2-196

LUNG CANCER SCREENING AMONG AFRICAN AMERICAN AND HISPANIC CURRENT AND FORMER SMOKERS FROM THE 2017 BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM

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Significance: Based on the National Lung Screening Trial (NLST), which showed that low dose CT scans (vs. chest X-ray) reduced mortality due to lung cancer by 20%, the USPSTF recommends annual lung cancer screening (LCS) for high risk individuals (> 30 pack-years, current smoker, or quit within 15 years). The current screening criteria were informed by the NLST findings, which were based on a racially homogenous sample (91% White). There is uncertainty regarding whether these eligibility criteria, when applied to racial/ethnic minorities, will result in a similar rate of mortality reduction, particularly for those at greatest risk for lung cancer. The goal of this analysis was to assess the impact of varying the pack-years criterion on the percentage of African American and Hispanic smokers who are eligible for LCS. **Methods:** Data were obtained from the 10 states participating in CDC's Behavioral Risk Factor Surveillance System 2017 health-related phone survey that included the LCS module. The analysis included Black (N=181), Hispanic (N=100), and White (N=3,185) current and former smokers between the ages of 55-80 years old with at least a 20 pack-year smoking history. We evaluated the percentage of smokers based upon increasing levels of risk (20, 25, 30 pack-years) and conducted bivariate analyses to compare smoking behaviors and screening utilization by race/ethnicity. **Results:** Overall, White smokers had the highest median pack-year smoking history (Median=38.0) compared to Hispanic (Median=37.5) and Black smokers who had the lowest (Median=35.0; $p < .01$). Black and Hispanic participants (12.0% and 16.1%, respectively) were less likely to meet the USPSTF criteria for LCS than Whites (24.2%; $p < .001$). There were too few Black and Hispanic respondents to assess for differences in screening rates in the past year. When pack-years were reduced to 25, the overall proportion of eligible individuals increased, and the between group difference remained (13.9% Black, 19.8% Hispanic, 27.0% White; $p < .001$). This relationship persisted with 20 pack-years (19.2% Black, 23.6% Hispanic, 32.3% White; $p < .001$). **Conclusion:** Black and Hispanic current and former smokers had fewer pack-years and were less likely to meet USPSTF criteria for LCS when compared to Whites. This may ultimately result in greater disparities in lung cancer mortality and suggests that the development of additional risk-based criteria in determining LCS eligibility is needed, especially among minorities most impacted by the disease who may most likely benefit from early detection.

FUNDING: Federal

PS2-197

PARENTAL SMOKING MEASURES MAY MISS RISK FOR ADOLESCENT SMOKING AMONG NON-TRADITIONAL FAMILY STRUCTURES

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Significance: Extensive research has demonstrated that having parents who smoke increases the odds of tobacco use among their offspring. This research has typically inquired about parental smoking, assuming a traditional family structure. However, as the U.S. population has become more diverse, alternative family structures have become more common. For example, among Black populations, adolescents are more likely to live with extended family members. Nonetheless, few studies have assessed the influence of tobacco use in family members beyond the parents. Assessing other influences in the home may represent a methodological concern, since researchers may be overlooking important influences on adolescents' decisions about tobacco. **Methods:** The current study is a secondary analysis on a sample of adolescents to determine the prevalence of traditional family structures (living with mother and father) and non-traditional family structures (living with someone other than mother and father, living with only one biological parent, or living alone), and examine if family structure



was associated with race. The sample contained 183 high school students caught with tobacco in school as part of a parent study assessing the acceptability of various smoking cessation program components. The mean age was 16.4 years ($SD= 1.1$) and 40.4% of students were Black. Students were told that they were not expected to quit smoking. Descriptive statistics were used to determine the number of students with traditional versus non-traditional family structures, and chi square tests were used to assess whether there was a statistically significant association between race and family structure. **Results:** Results indicated that 10.8% of Black students had a traditional family structure compared to 35.8% of White students. Chi square tests indicated that race was significantly associated with family structure, chi square (1, $N = 180$) = 14.4, $p < .0001$. The majority of the adolescents, regardless of race, had non-traditional family structures. **Conclusions:** These findings may suggest that other individuals, such as grandparents or step-parents, may influence adolescent smoking behaviors, particularly among Black students, who are more likely to have a non-traditional family structure than White students. Our results suggest that studies of family influences on adolescent tobacco use may systematically underestimate these effects for Black youth. Researchers are urged to consider comprehensive assessments of familial models in studies of adolescent smoking.

PS2-198

TRENDS IN WATERPIPE USE AMONG ADOLESCENTS AND ADULTS: POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY (2013-2016)

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Significance Waterpipe tobacco smoking has become a national public health problem in the U.S. Evidence shows that it is associated with known smoking-related health effects (leukemia, gastric cancer, pulmonary and cardiovascular dysfunction) and addiction. This study is to examine trends in waterpipe tobacco smoking among U.S. adolescents and adults between 2013-2016. **Methods** Data were drawn from Wave 1 to Wave 3 (2013-2016) of the PATH Study with 32,320 adults (ages ≥ 18 years) and 13,651 adolescents (ages 12-17 years). We assessed the weighted proportions of ever and current (past 30 days) waterpipe tobacco smoking stratified by age, race and gender. **Results** Adolescents aged 15-17 had higher prevalence of ever and current waterpipe tobacco smoking compared to 12-14 years old (p -values < 0.001). Female adolescents (aged 12-17) in general had higher prevalence of ever and current waterpipe tobacco smoking compared to male ones (p -values < 0.001). Racial patterns showed that Hispanic adolescents had the highest prevalence of ever waterpipe tobacco smoking compared to Non-Hispanic White, Black, and other races (p -values < 0.001). From 2013-2016, the prevalence of ever and current waterpipe tobacco smoking decreased by 29.8% and 58.8% among adolescents ($p < 0.001$ for all trends). In contrast, among adults, we found an 18.1% increase in the prevalence of ever waterpipe tobacco smoking between 2013-2016 ($p < 0.001$ for all trends), and a predominance of waterpipe tobacco smoking among males compared to females ($p < 0.001$). Young adults aged 18-24 had the highest prevalence of ever and current waterpipe tobacco smoking compared to other age groups (p -values < 0.001). **Conclusions** Waterpipe tobacco smoking in the U.S. seems particularly popular among adolescent females, Hispanics, and males aged 18-24 years. These groups should be considered as priority targets for interventions to reduce waterpipe tobacco smoking in the U.S.

FUNDING: Unfunded; State; Academic Institution; Nonprofit grant funding entity

PS2-199

SEX DIFFERENCES IN THE ASSOCIATION BETWEEN MARIJUANA AND MENTHOL CIGARETTE USE AMONG AFRICAN AMERICAN CIGARETTE SMOKERS

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Significance: Despite the strong relationship between marijuana and tobacco use, especially among African American individuals and males, very few studies have examined the association between marijuana and menthol cigarette use. This study was designed to identify the prevalence and predictors of lifetime marijuana use among menthol cigarette smokers, as well as the association between past month marijuana and past month menthol cigarette use among African American male and female cigarette smokers. **Methods:** Data were drawn from 1,992 (990 menthol cigarette smokers) African American individuals aged 12 years and older who reported past month cigarette use in the 2017 National Survey on Drug Use and Health. **Results:** Overall, 8.8%, 13.9%, and 44.4% of African American menthol cigarette smokers reported past month, past

year and lifetime marijuana use, respectively. Alcohol use and nicotine dependence (and cigar use among males) were significant predictors of lifetime marijuana use among both male and female menthol cigarette smokers. Logistic regression models also revealed that marijuana use was associated with decreased odds of menthol cigarette use among males, while marijuana use was associated with increased odds of menthol cigarette use among females. **Conclusions:** When stratified by sex, marijuana use is related differentially to menthol cigarette use among African Americans. Given the prevalence of menthol cigarette use among this population, it is important to examine factors such as marijuana use that could be targeted in prevention and treatment interventions for African Americans, especially females, who are at risk for smoking or are currently smoking menthol cigarettes.

FUNDING: Unfunded; Federal

PS2-200

EXPLORING TRANSGENDER AND GENDER DIVERSE YOUNG ADULT TOBACCO USE

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Background: Studies that focus on gender minority (GM) young adults, individuals whose gender identity does not align with the biological sex they were assigned at birth, are scarce in tobacco research. We explored the reasons and contexts GM young adults reported using tobacco to better inform a growing number of initiatives that are dedicated to improving the disproportionate tobacco burden for sexual and gender minority individuals.

Methods: We conducted 25 one-on-one semi-structured interviews with GM young adult ever tobacco users. Participants were 68% ($n=17$) assigned female at birth, and identified as non-binary, genderqueer, and transgender, among others. Participants were, on average, 23 years old, and were 64.0% non-Hispanic White, 24% Hispanic, and 12% other or multiple race/ethnicities.

Results: GM-specific reasons participants reported using tobacco concerned coping with stress stemming from proximal and distal stressors, as well as more accepting tobacco social norms in GM social circles. Examples of distal stressors included interpersonal conflicts with family members and the general public related to non-cisgender gender identity. Proximal stressors involved psychological distress including feelings of hopelessness, self-harm, and body dysphoria related to GM gender identity. Contexts of GM young adult tobacco use appear to overlap with those reported by other young adult studies, such as social use in bars and clubs, and concurrent use with other substances, especially alcohol and marijuana.

Conclusion: Consistent with the minority stress framework, GM identity appeared to play a direct role in some reasons participants reported using tobacco products, particularly through coping with stressful interpersonal interactions and internalized stressors like psychological distress. Understanding how GM individuals may possess added risk for tobacco use in navigating a larger heteronormative and cisnormative society will improve tailored initiatives that so far have failed to account for GM-specific reasons and contexts for tobacco use.

FUNDING: Federal

PS2-201

SUBJECTIVE SOCIAL STATUS INDIRECTLY INFLUENCES SHORT-TERM SMOKING CESSATION THROUGH NICOTINE WITHDRAWAL SYMPTOMS

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Few studies examine potential mechanisms linking subjective social status with smoking cessation. Thus, this study uses data from 146 adults enrolled in a smoking cessation program to evaluate whether subjective social status indirectly influences cessation through nicotine withdrawal symptoms. Findings indicated that subjective social status indirectly affected smoking cessation through withdrawal symptoms, specifically through anger and anxiety symptoms. People with a lower subjective social status report more withdrawal symptoms, particularly anger and anxiety, shortly after a quit attempt, and as such, are less likely to achieve smoking abstinence.

FUNDING: State; Academic Institution; Nonprofit grant funding entity



PS2-202

SMOKING CESSATION METHODS AMONG HOMELESS YOUTH IN A MIDWESTERN CITY

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Significance: Nearly three times as many homeless youth smoke cigarettes in the United States (US) compared to the general population of youth. Few studies have focused on how to help homeless youth quit smoking. As part of a series of studies to develop a smoking cessation intervention for homeless youth, this study aimed to describe methods used in past quit attempts by homeless youth. **Methods:** Recruited from a drop-in center in the Midwestern US, the analytic sample was comprised of 32 unaccompanied homeless youth aged 14-24 who smoked combustible tobacco at some point in the past week. In-person qualitative interviews were conducted to understand the prior quit attempt experiences of homeless youth. **Results:** Most youth (69%) were willing to quit smoking in the next 30 days. Previous quit attempts were mostly unassisted, with participants reporting engaging in distracting behaviors (e.g., video games) or thoughts (e.g., remaining positive). Nicotine replacement therapy was another popular method, but with mostly negative reactions. While less common, vaping and use of cannabis to substitute cigarettes was reported in a notable fraction of youth, primarily 18-24 years of age. **Conclusion:** Youth are primarily engaging in informal strategies to quit smoking. Existing evidence-based treatments are underutilized but youth who did use evidence-based treatments did not find them useful. Future research should explore effective cessation treatment among homeless youth that can ideally be provided at shelters and drop-in centers.

FUNDING: Federal

PS2-203

IS BMI ASSOCIATED WITH VAPING OUTCOMES?

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Previous research suggests individuals with a higher body mass index (BMI) are using electronic cigarettes (e-cigs) for weight control. However, there is little research about the relationship between BMI and other vaping outcomes (i.e., vaping frequency, beliefs about the benefits of vaping). The purpose of this study was to determine whether students with higher BMIs are more likely to have positive beliefs of vaping and engage in the behavior more frequently. College students in the Mid-South ($N=486$, female=73.2%, White=52.9%, African American=30.5%) completed an online survey regarding cigarette and e-cigarette use. We used BMI classes (underweight, average, overweight, obese) as the independent variable to predict the frequency of vaping. In addition, BMI category was used to predict both the belief that vaping can help people lose weight and the belief that vaping makes one look athletic or physically fit. Overall, BMI category predicted the belief that vaping can help people to control their weight, $F(3, 430)=3.319, p=.020$. Post hoc comparisons indicated that individuals with obesity believed more in the weight control "benefits" of vaping. In addition, BMI predicted the belief that vaping can help people look athletic or physically fit $F(3, 430)=2.670, p=.047$. Post hoc comparisons revealed that students who were obese were more likely to believe that vaping conveyed an impression of athleticism or physical fitness. Finally, BMI predicted the amount of time spent vaping per day $F(3, 142)=3.672, p=.014$. Post hoc comparisons indicated that individuals with obesity were vaping significantly less than average or overweight BMI classes. Overall, these results reveal a consistent pattern such that individuals with greater body mass were more likely to believe that vaping has positive effects on one's appearance. However, individuals with obesity used e-cigarettes less frequently those with a normal or overweight BMI. Future studies should investigate why individuals with obesity report vaping less, but seem to endorse more beliefs about the benefits of using e-cigarettes.

PS2-204

TRANSITION PATTERNS IN CIGARETTE AND E-PRODUCT USE AMONG US ADULTS

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Significance: While the popularity of e-products is increasing, few studies have characterized the dynamic patterns of use and co-use with cigarettes, nor examined the sensitivity of these patterns to varying use definitions.

Methods: Using PATH data from Waves 1 and 3, we assessed US adult prevalence of cigarette and e-product use and transitions between cigarette and e-product use at various frequency thresholds (5+, 10+, 20+ days in the past 30 days) to differentiate less frequent (under threshold) versus more frequent (at or above threshold) use. **Results:** At Wave 1 (2013-2014), the majority of cigarette smokers were more frequent users and most remained as such in Wave 3 (2015-2016), while less frequent cigarette smokers had a more transient pattern of use. For example, using the 10+ days definition, 46.8% of 1-9 days smokers in Wave 1 became non-current smokers and 28.5% became 10+ days smokers by Wave 3. E-product and dual use was generally temporary. For instance, about 70% of 1-9 days e-product users and 44% of 10+ days e-product users in Wave 1 became non-current users by Wave 3. With respect to single product use, 14% of 10+ days e-product only users in Wave 1 became 10+ days cigarette only users by Wave 3; a small proportion of 10+ days cigarette only users (3.3%) and 10+ days e-product only users (4.4%) in Wave 1 became 10+ days dual users by Wave 3. Among 10+ days dual users in Wave 1, 44% became 10+ days cigarette only users, 10% 10+ days e-product only users, and 10% non-current users by Wave 3. These patterns were consistent across different use frequency thresholds. **Conclusions:** From 2013-2016, e-product use among adults was somewhat transient, with many users transitioning to non-current use. In contrast, cigarette use was more stable, particularly for more frequent smokers. It will be critical to characterize longitudinal tobacco product use transitions over time to fully understand the impact of the emergence of new products and regulations. **Note:** We plan to add transitions into Wave 4 prior to the SRNT meeting.

FUNDING: Federal

PS2-205

GEOGRAPHIC ISOLATION PREDICTS TOBACCO PRODUCT USE AMONG YOUTH USING LATENT CLASS ANALYSIS

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Introduction: Tobacco users are considered vulnerable when they reside in geographic locations that are relatively isolated from employment, educational, and healthcare opportunities. Indeed, rates of cigarette and smokeless tobacco (SLT) use are consistently higher in isolated areas such as those more rural than urban in nature. Work that addresses such differences for use of other products (electronic cigarettes [ECIGs], cigars, waterpipe) is scarce, but suggests either the opposite pattern or comparable rates as a function of isolation. This secondary analysis identified classes of adolescent tobacco users via latent class analysis, and determined whether geographic isolation predicts class membership. **Methods:** The sample consisted of 579 middle and high school students (Mean age=15.9, SD=1.2; 84.1% White; 60.4% female) from north-central Appalachia. Items from the Youth Risk Behavior Survey assessed lifetime use of cigarettes and ECIGs, as well as current use of cigarettes, ECIGs, cigars (type aggregated), and SLT. Geographic isolation was measured via the Isolation scale, whereby residential zip codes determined the degree to which respondents have access to resources. **Results:** LCA classified participants as *Nonusers* (low lifetime and current rates of all products; 68.3%), *ECIG Users* (high lifetime and current rates of ECIG use; 11.2%), *Experimenters* (high lifetime, but low current, rates of cigarettes and ECIGs; 12.5%), and *Polytobacco Users* (high lifetime and current rates of all products; 8.1%). Controlling for demographic covariates, higher Isolation scores were observed for *Polytobacco Users* (OR [95% CI] = 1.51 [1.14, 2.02]) and *Experimenters* (1.30 [1.07, 1.58]) relative to *Nonusers*, and for *Polytobacco Users* relative to *ECIG Users* (1.61 [1.14, 2.29]). **Conclusion:** Results show that individuals with higher rates of polytobacco use reside in more isolated areas than nontobacco users and ECIG users. Regulatory policies at all levels should be viewed through a lens that considers geographically isolated areas. Cessation interventions might also be tailored for those regional characteristics that clearly disadvantage residents toward tobacco use.

FUNDING: Federal

PS2-206

THE BENEFITS OF USING SKIP LOGIC IN ELECTRONIC SURVEILLANCE, FINDINGS FROM THE NATIONAL YOUTH TOBACCO SURVEY

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Significance: The National Youth Tobacco Survey (NYTS) has successfully monitored youth tobacco use patterns among U.S. middle and high school students using a paper and pencil format since 1999. By modernizing NYTS to an electronic format, the time interval between data collection and dissemination to the general public could be significantly shortened. CDC conducted a pilot study to determine the feasibility, as well as potential benefits and limitations, of administering skip logic in an electronic version of NYTS in school settings. **Methods:** The pilot survey was conducted among middle and high school students in 2018 using two versions: an electronic version that mimicked the paper and pencil form without programmed skip logic and tobacco product images (Version 1); and an electronic version with programmed skip logic and tobacco product images (Version 2). In total, 2,769 students completed a version of the survey; 1,378 completed version 1 and 1,391 completed version 2. The survey completion time, efficiency of skip logic, perceptions of electronic device usage, and prevalence of tobacco product use were assessed; differences by version were assessed by t-test (completion time) or chi-square test (perceptions, prevalence). The odds of ever and current tobacco product use by versions was assessed using logistic regression. **Results:** Incorporating skip logic (Version 2) reduced the mean survey completion time by 15%, the number of questions that respondents needed to answer by 30%, and the number of contradictory and inconsistent survey responses to zero. There was a significant difference ($p < 0.05$) in the prevalence of ever use of e-cigarettes between Version 1 (22.2%) and Version 2 (29.5%). However, no other statistically significant differences in ever or current use were observed for any other assessed tobacco product. **Conclusion:** Results of this pilot survey supported the inclusion of skip logic in electronic surveillance of youth tobacco product use. These data helped support a full scale electronic administration of the NYTS in 2019, which allowed for expedited dissemination of data and results to the general public in comparison to prior survey years.

FUNDING: Federal

PS2-207

SMOKED TOBACCO, AIR POLLUTION, AND TUBERCULOSIS IN LAO PDR: FINDINGS FROM A NATIONAL SAMPLE

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Significance: In 2017, more than half of the global burden of disease from tuberculosis (TB), came from the Western Pacific Region. In Lao People's Democratic Republic (PDR), the high rates of tobacco use and use of polluting biomass fuels for cooking (e.g., wood, charcoal, crop waste, dung) both represent significant risk factors for TB. The purpose of this study was to determine the association between self-reported 1) smoking and TB, and 2) exposure to air pollution (from both cooking fires and environmental tobacco smoke) and TB among adults in Lao PDR. **Methods:** We analyzed data from the 2012 National Adult Tobacco Survey (NATSL) of Lao PDR - a multi-stage stratified cluster sample of 9,706 subjects from 2,822 households located in all 17 provinces. **Results:** Utilizing a nationally representative sample, we observed a significant increase in odds of self-reported TB among those who smoked tobacco (OR = 1.73 95% CI = [1.00, 2.98]). Larger multivariable models identified independent contributions from exposure to tobacco pipes (OR = 21.51 95% CI = [6.34, 72.89]) and communal outdoor fires (OR=2.27 95% CI = [1.15, 4.49]). An index measuring combined exposure to smoked tobacco, environmental tobacco smoke in enclosed work-space, indoor cooking fire, trash fires, other outdoor communal fires also showed a positive association (OR per added exposure = 1.47 95% CI = [1.14 to 1.89]). **Conclusions:** The findings of this study underscore the need for multi-sectoral collaboration between tobacco control, environmental health, TB prevention initiatives and control programs, national authorities, policy makers, civil groups, and the private sector to address the convergence of potential risk factors impacting respiratory health in Lao PDR. [Funding: 5R03TW007345-03, 2R01TW005964-06]

FUNDING: Federal; Tobacco Industry

PS2-208

TOBACCO USE AND THE INTERPLAY OF INTERNALIZING, EXTERNALIZING AND SUBSTANCE USE PROBLEMS: A LATENT CLASS ANALYSIS OF DATA FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: The prevalence of cigarette smoking is greater for adults with two or more psychiatric disorders (psychiatric comorbidities) compared to adults with one psychiatric disorder or no disorders, yet research on whether individuals with psychiatric comorbidities disproportionately use non-cigarette tobacco products is scant. The objectives of this study were to use latent class analysis (LCA) to identify unique classes of individuals based on symptoms of psychiatric disorders and to assess differences in demographic characteristics and tobacco use behaviors between classes. **Methods:** This study used data from Wave 2 of the Population Assessment of Tobacco and Health study adult dataset. LCA was used to classify individuals based on internalizing, externalizing and substance use problems. Bivariate models examined the association between latent class membership and current use of cigarettes, cigar products, electronic nicotine delivery systems, pipe, hookah and smokeless tobacco products. **Results:** Three latent classes were identified. The "normative" class reported low prevalence of all symptoms, the "severe internalizing and non-violent externalizing" class reported severe internalizing problems and non-violent externalizing problems and the "severe" class reported high prevalence of all symptoms. Tobacco use was highest for the "severe" class and lowest for the "normative" class across products. **Conclusions:** Individuals in the "severe" class may be at elevated risk of tobacco-related morbidity and mortality and would likely benefit from targeted tobacco control interventions.

FUNDING: Academic Institution

PS2-209

NATIONAL TRENDS IN E-CIGARETTE ADVERTISING AWARENESS AMONG YOUTH BY RACE AND ETHNICITY, 2014-2018

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Significance: E-cigarette (e-cig) advertising expenditures increased from 2011-2014 and e-cigs are now the most prevalent tobacco product among youth. Research shows that awareness of e-cig advertising among youth varies by channel and race/ethnicity, yet it's unclear if these patterns have changed over time. This study used combined, weighted data from the 2014-2018 National Youth Tobacco Surveys to examine trends in exposure to e-cig advertising among youth (ages 12-17) over time by race/ethnicity. **Methods:** Exposure to e-cig advertising via the point-of-sale (POS), the internet, print and TV/movies was assessed. Youth who reported seeing advertising "often" or "all the time" were coded as aware via that channel. Race/ethnicity categories included 1) non-Hispanic (NH) white, 2) NH black, 3) NH Asian, American Indian/Alaska Native (AI/AN), Native Hawaiian and Other Pacific Islanders (NHOPi), 4) NH multiracial and 5) Hispanic. Chi-square tests were used to examine awareness by channel, overall and by race/ethnicity. Orthogonal polynomials were used to perform logistic regression analyses and to examine trends in awareness by channel, overall and stratified by race/ethnicity. **Results:** Across years, awareness of e-cig advertising was most prevalent at the POS (30%), followed by TV/movies (12%), the internet (11%) and print (10%). Awareness at the POS was lowest among NH Asian, AI/AN and NHOPi (22%) and highest among multiracial youth (31%). Awareness of print, internet and TV/movie advertising was highest among NH blacks. For all racial/ethnic groups, there were downward linear trends in awareness of internet advertising. For print, there were downward linear trends for all groups, except NH Asian, AI/AN and NHOPi youth. For POS and TV/movies, there were significant downward linear trends for all groups. **Conclusion:** Despite overall declines in awareness of e-cig advertising, awareness remains disproportionately high among racial/ethnic minorities; given the association between e-cig advertising and e-cig use, researchers may want to examine strategies for reducing exposure to e-cig advertising among these populations.

FUNDING: Unfunded



POSTER SESSION 3

PS3-1

HISTORY OF CANNABIS USE DISORDER AND PERINATAL SMOKING

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Significance. Cannabis use (CB) has increased as tobacco use (TOB) has decreased. However, cigarette smoking rates have not decreased equally among all groups, and women who use cannabis may be at greater risk of perinatal tobacco use (TOB). We compared smoking histories among women with: (1) no history of cannabis use (No CB), (2) a history of any cannabis use (CB), and (3) current or past Cannabis Use Disorder (CUD). **Methods.** Pregnant women (N=256, Mage=28.4 years old; 51% Black, M=16 weeks pregnant) with a BMI > 24.5 were recruited for a longitudinal study of eating and other behaviors. Women provided demographic information and smoking history and completed the Structured Clinical Interview for DSM-IV. Logistic regressions compared rates of smoking among women with histories of cannabis use (CB, n=85) and CUD (CUD, n=38) vs. women without prior cannabis use (No CB, n=133) controlling for education, race, family income, parity, and health insurance status. **Results.** There was a dose-response relationship for CB history and indicators of social disadvantage, such that women from the CB group were more disadvantaged than women from the No CB group, but less disadvantaged than the women from the CUD group. The CB/CUD groups had lower family income and education, more children, and were more likely to be Black than the No CB group. After controlling for demographic differences, history of CUD predicted earlier age of smoking initiation, history of nicotine dependence, smoking cigarettes in early and late pregnancy, and smoking cigarettes 6 months postpartum. There were no differences between the CB and CUD groups in smoking behaviors, and no group differences in quitting for pregnancy, partner's smoking status, and individual factors related to staying quit (motivation, plans, and confidence). **Conclusion.** Pregnant women with a history of CUD are more likely to smoke during and after pregnancy compared to women with no history of CB, despite similar motivations and plans to quit. Given that disadvantaged women are also more likely to use CB, addressing the health disparities that lead to TOB+CB use in women may improve health outcomes for mothers and children.

FUNDING: Federal

PS3-2

A COMPARATIVE EFFECTIVENESS TRIAL EXAMINING FINANCIAL INCENTIVES FOR SMOKING CESSATION AMONG PREGNANT WOMEN

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Smoking during pregnancy is the leading preventable cause of poor pregnancy outcomes in the US. Efficacious interventions are available, but cessation rates are low (<20%). There is broad consensus that more effective interventions are sorely needed. We are programmatically investigating a behavioral-economic intervention in which women earn financial incentives contingent on smoking abstinence. Prior research supports the efficacy of this approach but further research is needed including (1) comparative effectiveness trials of this intervention against current best practices and (2) assessing effects on birth outcomes in prospective trials. To examine these and other unanswered questions, we conducted a randomized, controlled clinical trial comparing the efficacy of Best Practices Only (referral to pregnancy-specific quit line with follow-up) for smoking cessation during pregnancy vs. Best Practices plus Incentives (vouchers exchangeable for retail items though 12 weeks postpartum) among 169 pregnant women. We also included a 3rd condition of 80 pregnant never-smokers matched to the smokers on socio-demographics and health conditions to compare the extent to which the treatments reduced the burden of smoking on birth outcomes. Financial incentives increased late-pregnancy 7-day point-prevalence abstinence (38% vs. 9%, $p < .001$, OR: 6.2, 2.6-14.6); that effect remained significant at 12-weeks postpartum (26% vs. 11%) when incentives were still in place, but dissipated by 24-weeks (17% vs. 13%) after incentives were discontinued. Regarding birth outcomes, financial incentives reduced

although did not eliminate adverse effects of smoking. For example, odds of having a small-for-gestational-age infant were significantly greater among Best Practices Only vs. Never Smokers (4.4, 1.2-16.1), but not Best Practices plus Incentives vs. Never Smokers (2.18, 0.6-8.5). The results provide additional strong evidence that current best practices for smoking-cessation among pregnant women could be substantially improved by adding financial incentives, and suggest doing so will reduce the impact of smoking on birth outcomes. Strategies to better sustain abstinence are needed.

FUNDING: Federal

PS3-3

PRENATAL TOBACCO AND CANNABIS CO-USE: IMPACT ON INFANT CORTISOL STRESS RESPONSE

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Significance: Despite evidence for increasing cannabis (CB) use and high rates of co-use of tobacco (TOB) and CB during pregnancy, little is known regarding the joint effects of prenatal TOB+CB exposure on offspring development. We investigated the impact of co-exposure to TOB+CB on cortisol response to simulated daily handling stress over the first postnatal month—a period of critical importance for parent-infant attachment and early identification and prevention efforts. **Methods:** Participants were 111 mother-infant pairs from a low-income, diverse sample (Mean age=25±5; 50% minorities). TOB and CB use were assessed by Timeline Followback interview with biochemical confirmation. Three groups were identified: (a) prenatal TOB+CB, (b) TOB only, (c) controls. Cortisol stress response was assessed at 7 time points over the first postnatal month using a daily handling paradigm in which saliva cortisol was assessed before, during, and following the NICU Network Neurobehavioral Scale (NNS). **Results:** Controlling for confounders, both TOB+CB and TOB-exposed infants showed attenuated cortisol reactivity vs. unexposed infants ($p=.026$); TOB+CB-exposed infants also trended toward attenuated baseline cortisol vs. TOB-exposed infants ($p=.106$). In sex-stratified analyses, effects of TOB+CB co-exposure on cortisol response were more pronounced for male infants. Specifically, TOB+CB-exposed males displayed attenuated baseline cortisol levels vs. TOB-exposed and unexposed males ($p=.002$) and attenuated cortisol reactivity vs. unexposed males ($p=.023$), while no significant effects emerged for females ($p>.21$). **Conclusion:** Results suggest altered stress hormone regulation and inadequate biological response to daily stressors in TOB+CB-exposed infants—particularly males. Results highlight the synergistic impact of even low levels of CB co-use on biological stress response and represent the first evidence that prenatal CB may program offspring cortisol regulation in humans. Findings highlight the critical importance of investigating prenatal substance exposures in concert and in relation to offspring sex and the need for interventions to address CB co-use in pregnant TOB users.

FUNDING: Federal

PS3-4

PRENATAL EXPOSURE TO TOBACCO AND CANNABIS: RELATIONAL AND PHYSICAL AGGRESSION IN AN AT-RISK SAMPLE

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Prenatal tobacco exposure (TOB) poses risk for higher physical aggression in children. Recent research has also highlighted understanding the impact of prenatal co-exposure to tobacco and cannabis (TOB+CB); however, prenatal TOB and TOB+CB and the development other forms of aggression such as relational aggression (i.e., removal or the threat of the removal of relationships as the means of harm) has yet to be examined. In addition, maternal substance use is often characterized by attempts to cut down and relapse that may result in significant fluctuations in mood — suggesting an additional mechanism to child risk for aggression. Understanding mechanisms underlying the association between TOB/TOB+CB and aggression is important because even in early childhood, aggression is associated with negative outcomes. The present study examined the association between TOB/TOB+CB and aggression at early school age among a low-income, diverse sample (n=247; 116 female, 131 male; 53% African American) of children recruited prenatally with prospective, multi-method assessments beginning in the first trimester. TOB/TOB+CB was assessed using maternal self-report and biological assays. Infant/toddler postnatal exposure was assessed by maternal self-report. Mood unpredictability was calculated as a rate of entropy in responses on questionnaires, such as ratings of maternal anger. Mother-report of child aggression was assessed at Kindergarten. In a path analysis that fit the data well, prenatal TOB+CB accounted for unique variance in child physical aggression in Kindergarten, while maternal use of CB



during infancy and toddlerhood predicted child relational aggression. Unpredictability in maternal hostility and anger during infancy also accounted for unique variance in child relational aggression. Direct TOB/TOB+CB effects did not significantly vary by child sex. Results highlighted the importance of considering both TOB and TOB+CB as well as different forms of aggression. Further, maternal mood unpredictability may be a mechanism in the cascade of risk to aggression. Understanding early developmental pathways of risk for aggression is critical to intervening.

FUNDING: Federal

PS3-5

RELATIONSHIPS OF SELF-CONTROL AND CIGARETTE SMOKING BEHAVIORS AMONG A SAMPLE OF ADULTS LIVING WITH HIV/AIDS.

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Significance. Persons living with HIV (PLWH) smoke cigarettes at very high prevalences. Identifying variables related to smoking among PLWH can inform treatment efforts. Self-control has been linked to smoking in the general population, and can be strengthened with practice, but has yet not been examined among PLWH. The current study examined the association of smoking factors (e.g., smoking status, nicotine dependence) to self-control in a sample of PLWH. **Methods:** Adult PLWH were recruited from the Center for Positive Living (Montefiore Medical Center, Bronx, New York, US). All participants completed measures of demographics, cigarette smoking, and the self-report Self-Control Scale. Participants who reported current cigarette smoking completed measures of nicotine dependence; motivation, desire, and confidence related to quitting smoking; and intolerance for smoking abstinence. **Results:** The overall sample (n=285; 49% current cigarette smokers) was ~50 years old and just over half identified as male (55.4%), Black race (52.7%), and Latino/a ethnicity (51.6%). PLWH who smoked cigarettes reported lower self-control than PLWH who did not smoke cigarettes (M=116.88, SD=17.07 versus M=127.39, SD=20.32; t=-4.15, df=211, p<0.001). Among PLWH who reported cigarette smoking, lower self-control was associated with greater smoking quantity (r=-0.217, p<0.05), greater nicotine dependence (r=-0.285, p<0.01), and lower confidence in quitting smoking cigarettes (r=0.220, p<0.05). Self-control was not significantly associated with motivation or desire to quit smoking cigarettes. Lower self-control was associated with greater intolerance for smoking abstinence overall (r=-.321, p<0.05), withdrawal intolerance (r=-0.352, p<0.01), and pain intolerance (r=-0.194, p<0.05). **Conclusions:** Among PLWH, lower self-control was related to cigarette smoking, greater cigarettes smoked per day, greater nicotine dependence, lower confidence in quitting, and greater intolerance for smoking abstinence. Future research should examine whether targeting self-control would increase confidence in quitting smoking and smoking cessation outcomes among PLWH.

FUNDING: Federal; Academic Institution

PS3-6

MOTIVATION TO QUIT SMOKING MODERATES THE RELATIONSHIP BETWEEN GENDER AND INTERNALIZED HIV STIGMA AMONG PEOPLE LIVING WITH HIV

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SIGNIFICANCE: HIV is associated with a high prevalence of cigarette smoking and high levels of stigma. Gender differences in stigma exist with most research documenting greater levels of overall HIV stigma among women; however, findings for gender differences in internalized HIV stigma (IHS) remain inconclusive. Moreover, despite the high prevalence of smoking among people living with HIV (PLWH), the relationship of smoking and IHS has not been studied. The goal of this study was to examine gender differences in IHS and explore whether cigarette smoking behavior moderates this relationship. **METHODS:** This was a secondary analysis of data from a study on self-control among PLWH recruited from the Center for Positive Living in the Bronx (New York, United States (US)). Participants (N = 287) completed measures of demographics, smoking, and IHS. A t-test was used to examine gender differences

in IHS and hierarchical regression analyses were performed to examine smoking status, nicotine dependence, and motivation to quit smoking as potential moderators. Sexual orientation, AIDS status, and marital status were included as covariates based on preliminary analyses. **RESULTS:** Men reported greater levels of IHS compared to women (p = .028), however, among smokers, motivation to quit smoking moderated the relationship between gender and IHS (p = .042). Compared to men, women with lower motivation to quit smoking reported greater IHS and women with higher motivation to quit smoking reported less IHS. No other interactions were significant. **CONCLUSIONS:** This was the first study to examine gender differences in IHS in the US using a previously validated measure of IHS. Furthermore, it was the first study to explore the potential roles of smoking status, nicotine dependence, and motivation to quit smoking in this relationship. Findings highlights the need to distinguish between aspects of smoking behaviors and how they relate to experiences of HIV stigma among men and women. Moreover, findings suggest a demand for gender-responsive HIV interventions that combine smoking cessation, motivational interviewing, and strategies to address stigma surrounding gender, smoking, and HIV. **FUNDING:** Department and federal funds

FUNDING: Federal; Academic Institution

PS3-7

THE EFFECTS OF TOBACCO USE ON GASTROESOPHAGEAL REFLUX DISEASE ANALYZED BY ENDOSCOPIC FINDINGS AND GASTROINTESTINAL SYMPTOM RATING SCALE IN JAPAN

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Significance: Tobacco use is regarded as a risk factor of gastroesophageal reflux disease (GERD), and smoking cessation may reduce GERD symptoms. However, the evidence is limited. Here we investigated the effects of tobacco use or cessation on the development of GERD by using endoscopic findings and the Gastrointestinal Symptom Rating Scale (GSRs). **Methods:** The subjects were 848 patients who received upper endoscopy and the GSRs questionnaire as health checkup at our clinic in Japan. The patients were divided into three groups; non-smoking, smoking-cessation, and current-smoking group (322, 371 and 155 patients, respectively). Endoscopic findings of GERD were graded by the Los Angeles classification, and grade B or more were defined as severe GERD. The GSRs is an interview-based seven-graded rating scale including the questions on heart burn and acid regurgitation. The prevalence of patients with positive GSRs scores (2 or more) was compared between three groups. Data were analyzed statistically using the Kruskal-Wallis, Mann-Whitney U, or chi-square test. **Results:** The overall prevalence of endoscopic GERD and positive GSRs scores on heart burn and acid regurgitation was 19.2, 14.5, and 19.7%, respectively. The prevalence of patients with severe endoscopic GERD in smoking group was significantly higher than that in non-smoking group (OR: 4.64; 95% CI: 1.47-14.67; p=0.007). In contrast, the prevalence of patients with positive GSRs scores on heart burn in smoking group was significantly lower than that in non-smoking group (OR: 0.46; 95% CI: 0.26-0.80; p=0.006). As for smoking cessation, there was no significant difference in the prevalence of patients with severe endoscopic GERD (OR: 0.37; 95% CI: 0.11-1.18; p=0.149) or positive GSRs scores (heart burn; p=0.077, and acid regurgitation; p=0.871) between smoking-cessation and current-smoking group. **Conclusion:** In this study, tobacco use does NOT develop GERD symptoms. Although tobacco use increases risk of developing endoscopic GERD severity, smoking cessation does NOT decrease its risk. Health checkup using upper endoscopy may be meaningful for Japanese using tobacco even if they have no GERD symptoms.

PS3-8

IS LOW POSITIVE AFFECT A SYMPTOM OF TOBACCO WITHDRAWAL PRELIMINARY RESULTS FROM A SYSTEMATIC REVIEW

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Most descriptions of tobacco withdrawal have not changed in over 30 years despite a substantial amount of new research on the topic that identifies potential new symptoms. This review aimed to determine whether low positive affect (PA) is a symptom of tobacco withdrawal. Low PA and negative affect (NA) appear to be independent from one another and differ in that low PA refers to the absence of pleasant and energized mood states while NA refers to negative mood states like anxiety, sadness, and irritability.



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We searched for tests of whether PA decreases during abstinence from cigarettes. Our main inclusion criterion was a prospective within-participant test of change in PA during abstinence conditions among daily cigarette smokers who were not using a cessation medication. Our search of PubMed, PsycINFO, and personal libraries yielded a total of 36 tests. We independently entered study characteristics and results. Initial findings are reported here and results of the meta-analysis will be presented at the conference. Trials were published between 1984 and 2019; most used the Positive and Negative Affect Schedule (36%) or Profile of Mood States (39%) to assess change in PA. The median duration of abstinence was 1 day. Median sample size was 40 (range=6 to 275). Participants were mostly (75%) white and moderately dependent. Most (78%) trials excluded people with psychiatric disorders. Most (61%) trials found a significant decrease in PA during abstinence, 14% found no change, and 25% did not include significance tests. Our planned meta-analysis will quantify the magnitude of reduction in PA and examine moderators such as baseline dependence, psychiatric diagnosis, and duration of abstinence. Preliminary findings indicate that PA decreases after acute abstinence from cigarettes. If meta-analytic findings support this conclusion it could suggest a need to 1) add assessments of PA to withdrawal measures and diagnostic criteria, 2) examine the time-course of change in PA, 3) determine if PA effects occur independent of NA effects, 4) assess whether reductions in PA contribute to relapse, and, if so, 5) develop treatments to prevent reductions in PA after smoking cessation.

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PS3-9

IMPROVING TOBACCO CESSATION IN A VA POPULATION THROUGH SAME-DAY ACCESS PRIMARY CARE MENTAL HEALTH INTEGRATION

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SIGNIFICANCE: In the Veterans Health Administration (VHA), primary care Patient Aligned Care Teams (PACT) are the cornerstone of care provided to veterans, including tobacco cessation. Despite VHA increasing screeners and embedding mental health (MH) providers in primary care (PCMHI), too many veterans with MH issues, including tobacco use disorders, remain unidentified and untreated. **METHOD:** To address this issue, one primary care clinic at James A. Haley VA Hospital (JAHVH), led by PCMHI psychologists, initiated a multidisciplinary, collaborative performance improvement (PI) project. Veterans in this project were seen on the same day as their PACT visit and included 3 groups: veterans whose PACT providers requested veteran be seen, new patients to the clinic, and returning patients with limited previous MH contact. The last two targeted groups were identified through short medical record reviews. Encounters were voluntary and brief (15-30 minutes). The PI project ran from May 2018 to May 2019 (N=916). **RESULTS:** 21.3% (N=195) of veterans seen were currently using some type of tobacco product, with 11.3% using cigarettes (VHA 2018 rate 14.6%) and 10.0% using non-cigarette products (VHA does not assess). Of those current users, 46.2% were interested in quitting. Interested veterans were offered a menu of standard treatment options at JAHVH including: educational materials, coordinated medications from PACT, referral to VHA national cessation interventions (e.g., quit lines, web-based resources), scheduled PCMHI follow-up, and referral to JAHVH's tobacco cessation group. All patients interested in quitting received at least one intervention, with 83.3% agreeing to more than one intervention. **CONCLUSION:** This project demonstrated that within the VHA PACT model, same-day access PCMHI can play a significant role in tobacco cessation, through enhancing detection and increasing opportunities for evidence-based interventions. Notably, almost half of tobacco users seen were using non-cigarette products. Limited literature exists to date on non-cigarette tobacco users in VHA, with this study being one of the first to describe this group.

PS3-10

RISKS PERCEPTIONS AND DEPENDENCE IN ESTABLISHED SMOKELESS TOBACCO USERS.

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Background: While cigarette smoking has declined, smokeless tobacco (ST) use has remained consistent over the past 20 years. Underestimation of health risks of ST use may contribute to its persistent use. **Methods:** Data were obtained from 110 volunteers who were screened for participation in clinical studies of ST. Participants responded to questions about their personal use of ST and their perceptions of risks associated with ST use, using the Perceived Health Risk Questionnaire using visual

analog scales (0-100). **Results:** The participants were current daily ST users for >6 months with an average age of 33.2 ± 11.2 years, most had never married (63.6%), were White (80%), and had a high school education or more (95.5%). Average age of ST initiation was 19.8 ± (SD = 7.8) and age at regular use was 22.4 ± 8.5; average duration of regular use was 9.4 ± 8.2 years. The scores on the Modified Fagerström Test for Nicotine Dependence and Hooked on Nicotine Checklist were 4.1 ± 2.3 and 6.2 ± 3.0, respectively. The general perceived risk of ST on the 0-100 visual analog scale indicated high endorsement of perceived risk of mouth cancer (50.6 ± 28.7) and addiction (71.1 ± 28.8). The perceived risks on this scale for other negative outcomes (i.e., reproductive, cardiovascular, non-mouth cancer health risks) were all 35 or below. While a medical professional had recommended quitting to 45% of participants, only 4% thought that ST had caused a health problem. ST quit attempts were reported by 47% of participants—most tried to quit once but some (15%) made 3 or more quit attempts. **Conclusion:** Users of ST recognized addiction and mouth cancer as risks of ST use, but they were less aware of other known health consequences of ST use, seldom attempted to quit multiple times, and were only sometimes given advice to quit by health professionals. Education campaigns about the less widely known risks of ST use and counseling from medical professionals may help to address the persistently high use of ST. *Supported by FDA Contract #HHSF223201310030/HHSF22301002T and #HHS-F223201310030/HHSF22301003T*

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PS3-11

SMARTPHONE-ASSISTED MINDFULNESS-BASED INTERVENTION WITH CONTINGENCY MANAGEMENT FOR SMOKERS WITH MOOD DISORDERS RECEIVING OUTPATIENT PSYCHIATRIC TREATMENT: A PILOT RANDOMIZED CONTROLLED TRIAL

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Significance: Individuals with mood disorders are more likely to smoke, and to suffer tobacco-related morbidity and mortality than the general population, but smoking cessation interventions have modest effects in this population. Home mindfulness practice while abstinent may help those in greater affective distress quit smoking and remote contingency management (CM) may encourage short-term abstinence. **Methods:** We developed and pilot tested a smartphone-based mindfulness smoking cessation intervention with contingency management (SMI-CM). A total of 49 adult smokers receiving outpatient psychiatric treatment for mood disorders were randomized to receive SMI-CM (n = 25) or Enhanced Standard Treatment (EST) (n = 24) with non-contingent rewards. Participants in SMI-CM were prompted to practice mindfulness by listening to audio recordings. Both groups received 4 sessions of individual counseling and 8 weeks of nicotine patches. Participants submitted carbon monoxide (CO) videos twice a day for 2 weeks using a smartphone app. Outcomes included 7-day point prevalence abstinence at weeks 2, 4, and 13 post-quit (biochemically verified with CO ≤ 6 ppm and cotinine levels < 5ng/ml at week 13), and smoking-specific experiential avoidance. **Results:** Of the 49 participants, 75.5% were female, 57.1% were racial/ethnic minorities, 75.5% reported household incomes < \$24,999, and 65.3% were on disability/out of work > 1 year. Biochemically verified abstinence rates for the SMI-CM condition were 40.0%, 36.0%, and 16.0% vs. 4.2%, 8.3%, and 4.2% in the EST condition at weeks 2, 4, and 13. A GEE model showed significant overall differences in abstinence rates in SMI-CM vs. EST (OR = 8.37, 95%CI = 1.46 - 48.0, p = .017). Those who received SMI-CM reported significantly greater reduction in smoking-specific experiential avoidance from baseline to 3 days prior to quit date (β = -10.11, SE = 3.43, p = .005). **Conclusions:** SMI-CM may increase quit rates among smokers with mood disorders potentially through reducing smoking-specific experiential avoidance. SMI-CM is promising and warrants investigation in a fully-powered randomized trial. This study was supported by a grant from NIDA: R34 DA037364

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PS3-12

RELIGHTING BEHAVIOR AMONG VULNERABLE POPULATIONS IN RANDOMIZED CONTROLLED TRIALS OF REDUCED NICOTINE CONTENT CIGARETTES

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Significance: Relighting cigarettes, which is a risk factor for chronic bronchitis and possibly lung cancer, is a common but underreported behavior among highly dependent smokers. Little is known about the relighting behavior among vulnerable populations in clinical trials of reduced nicotine content cigarettes. This study examined the relighting behavior among adult cigarette smokers assigned to use SPECTRUM research cigarettes over 18 weeks. **Methods:** Relighting status and frequency were analyzed for 371 adult smokers of five or more cigarettes per day participating in studies of reduced nicotine content cigarettes. The sample consisted of smokers with no intention to quit, less than 16 years of education and/or comorbid mood and/or anxiety disorders. Participants were randomized to either Usual Nicotine Content cigarettes (UNC, 11.6mg/cig, n=197) or reducing nicotine content cigarettes over 18 weeks (RNC, last dose, 6 weeks on 0.2mg/cig, n=174). Relighting status was collected midway through the randomization phase. A Chi-square test was used to analyze relighting status with respect to the randomization group (UNC vs. RNC). **Results:** Out of the 371 participants randomized, 43.1% (n=160) reported relighting cigarettes during randomization (n=69, RNC; n=91, UNC; p=.204). The mean carbon monoxide level for those who reported relighting was 31.5 parts per million (n=158), and they reported relighting an average of 5 cigarettes out of a pack of 20 during the past 7 days. **Conclusion:** Smokers assigned to use SPECTRUM research cigarettes reported relighting, although they were provided at no cost. Relighting behavior, even when cigarettes are given for free, should be measured in future studies. Trials of reduced nicotine content cigarettes may be considered non-representative of normal smoking behavior as smokers are provided cigarettes at no cost. However, these results suggest that smokers persist with their normal smoking habits (e.g., relighting) believed to be associated with cost reduction, even when provided with free cigarettes.

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PS3-13

DISRUPTION OF CHOLESTEROL REVERSE TRANSPORT DURING SMOKING IN THE REGULATION OF THE IMMUNE RESPONSE IN COPD

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Cholesterol is one of the most important biochemical parameters for humans. A number of recent researches suggest that reverse cholesterol transport (RCT) regulates not only the homeostasis of cellular cholesterol, but also innate immunity. Involvement of cholesterol in the innate immune response is mediated by ATP-transporter ABCA1, regulating RCT. By regulating the content of cholesterol in lipid rafts, it is involved in the activation of TLR, phagocytosis and regulation of apoptosis. ABCA1 is highly expressed in the lungs and plays an important role in the development of chronic obstructive pulmonary disease (COPD). **Objective:** study the expression of genes ABCA1, ABCG1 in smoking. **Methods:** The analysis was carried out on previously studied data sets (gene sets) derived from Genes Expression Omnibus (GEO). **Results:** Researching of alveolar macrophages in smokers (sets GSE2125, GSE8823) showed a significant decrease in the expression of genes ABCA1, ABCG1 compared with non-smokers. Researching of monocytes in patients with COPD (set GSE8608) showed a significant decrease in the expression of ABCA1 compared with healthy individuals, which emphasizes changes in the activation of monocytes in peripheral blood. This can serve as a mechanism of trained innate immune response in atherosclerosis in COPD patients. Genes expression in the airway epithelium in smokers showed conflicting results. There were not significant changes in the gene expression of ABCB1, ABCG1 in sets GSE4498, GSE994, GSE11906, though in sets GSE76324, GSE18385, GSE11784 gene expression of ABCA1 increased. Expression of ABCA3 significantly increased in smokers in sets GSE76324, GSE18385, GSE63127, GSE64614, GSE11906, GSE11784. Gene expression in alveolar epithelial type II cells in patients with COPD compared with healthy individuals (set GSE29133) showed a significant decrease in the expression of genes ABCA1, ABCG1. **Conclusion:** Thus, smoking disrupts the RCT in monocytes, macrophages and respiratory epithelium, which probably serves as a mechanism of progression of local and systemic inflammation through the mechanisms of the innate immune system.

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PS3-14

IMPLEMENTATION OF AN "OPT OUT" TOBACCO TREATMENT INITIATIVE IN AN OUTPATIENT CLINICAL ONCOLOGY PRACTICE : PILOT STUDY

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Significance. Persistent tobacco use after a cancer diagnosis is detrimental to treatment and survivorship, yet few receive tobacco treatment. As part of the NCI Cancer Moonshot™ program, the National Cancer Institute (NCI) launched the Cancer Center Cessation Initiative to implement sustainable tobacco control programs. We designed an "opt-out" system that did not require clinician involvement to automatically refer patients, regardless of intent to quit, to the Mayo Clinic Nicotine Dependence Center (NDC). **Methods.** A Best Practice Advisory (BPA) was designed for the electronic medical record Epic, for the staff who room patients. The BPA prompts to ascertain tobacco use in the last 30-days and to record tobacco use status for all patients. For current tobacco users, a referral to the NDC is automatically placed (not requiring physician co-signing), and nicotine dependence is added to the visit diagnosis list to cue a discussion by the clinician with the patient. The recommended focus of this discussion is on the importance of attending the NDC consultation and does not require a commitment to quit. The NDC visit is scheduled during patient check-out. The BPA was piloted in the Medical Oncology practice at Mayo Clinic, MN beginning July 15th, 2019. **Results.** Development of the BPA required over 25 information technology experts and the review by multiple institutional committees. Since the first 3 weeks of implementation, of the 3472 patients that completed appointments, the BPA was activated for 460. Of these, 330 patients had incomplete tobacco histories or were not current smokers and 130 patients were confirmed as current smokers. An NDC appointment was scheduled for 102; 10 (10%) had completed a consult with the NDC by the end of the three-week period. **Conclusion.** An automatic opt-out referral system for cancer patients who use tobacco which does not require clinician involvement is feasible. Further work will determine if training clinicians to encourage attendance at the NDC can further increase the rate of patient acceptance of the referral.

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PS3-15

RELATIONSHIP BETWEEN PLASMA NICOTINE CONCENTRATION AND FREE NICOTINE CONTENT OF SMOKELESS TOBACCO PRODUCTS

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Significance: Unprotonated or "free" nicotine crosses biological membranes more readily than protonated nicotine. Limited evidence suggests that the free nicotine content of smokeless tobacco (ST) may affect nicotine exposure in ST users. **Methods:** Data from a clinical laboratory study were analyzed to examine the relationship between free nicotine content and plasma nicotine pharmacokinetic (PK) parameters. Participants were ST users who used loose ST (n = 29) or pouched ST (n = 19). Participants attended a single laboratory session, during which plasma nicotine was collected while they used one dip or pouch of their usual brand of ST during the first hour of the session. Participants' ST products were chemically characterized, such that pH and total nicotine content (i.e., protonated and unprotonated nicotine) were measured, and free nicotine content was calculated. Spearman correlations were estimated to assess the relationship between free nicotine content and plasma nicotine PK parameters. **Results:** In participants who used loose ST, significant positive relationships were observed between free nicotine content and maximum plasma nicotine concentration (C_{max} ; $r_s = 0.544$, $p = 0.002$) and between free nicotine content and area under the nicotine concentration curve (AUC; $r_s = 0.514$, $p = 0.005$). In participants who used pouched ST, a modest but nonsignificant positive relationship was observed between free nicotine content and C_{max} ($r_s = 0.357$, $p = 0.1$), and a significant positive relationship was observed between free nicotine content and AUC ($r_s = 0.477$, $p = 0.04$). No significant relationships were observed between free nicotine content and time to maximum nicotine concentration (T_{max}) in loose ST users ($r_s = 0.164$, $p = 0.4$) or pouched ST users ($r_s = 0.289$, $p = 0.2$). No significant relationships were observed in either group between total nicotine content and plasma nicotine PK parameters. **Conclusion:** The results suggest nicotine exposure from ST is more strongly associated with free nicotine content of ST products than total nicotine content, particularly in loose ST users. Potential reasons for the differences observed between groups are discussed.

FUNDING: Federal



PS3-16

REMOTE MONITORING OF SMOKING AND RELAPSE IN YOUTH WITH AND WITHOUT REMOTE BIOCHEMICAL VERIFICATION

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Significance: Research to better understand and prevent smoking relapse in youth is key to improving public health. Technological enhancement of research methods may provide more accurate and fine-grained data to study relapse, but incorporating technology must demonstrate benefit over traditional methods without adversely impacting compliance. **Methods:** Participants (N=39) were youth daily cigarette smokers (ages 15-25; Mage=21.6±2.1; 56% male; 74% White; 9.2±5.1 mean cigarettes per day), who were asked to self-report their smoking using ecological momentary assessment (EMA) over 35 days, which included a 2-day quit attempt (Days 7-8). Half of the participants were randomized to the My Mobile Monitor (M³) group, which included EMA plus remote carbon monoxide (CO) capture twice per day. The EMA-only group completed weekly, in-person visits to provide CO. Groups were compared on; 1) abstinence during the quit attempt (CO of 6 parts per million or 75% reduction from baseline), 2) agreement in self-reported (SR) smoking and CO, and 3) remote session compliance. The aims were to test any benefit of added remote CO monitoring on accuracy of self-report and cessation engagement. **Results:** During the quit attempt, 15% of participants in the M³ (Remote CO) group met criteria for sustained abstinence (based on SR and four remote CO samples), while 47% of the EMA-only group met criteria for sustained abstinence (based on SR and one CO sample). Agreement in SR smoking and CO differed numerically across groups during the quit attempt (M³: 50% agreement vs. EMA: 68%), but not at the end of the study (M³: 60% vs. EMA: 58%). Compliance rates across all remote sessions were similar across groups (~75%), except in the case of randomly-prompted sessions, in which the M³ group had to complete remote CO samples and had lower rates of completion compared to the EMA-only group (M³: 38% vs. EMA: 57%; p=0.14). **Conclusions:** Across two remote monitoring platforms, one with remote CO capture and one without, agreement in smoking and CO appeared to be higher in the EMA-only group following the quit attempt. Without remote CO, more participants met criteria for sustained abstinence during the quit attempt (47% vs. 15%), and remote CO monitoring as part of self-report mobile assessments contributed to lower rates of session compliance. These results suggest that technological enhancement improves data accuracy through objective measures, but may also introduce additional compliance barriers, threats to self-report accuracy, and may result in higher rates of missing data.

FUNDING: Federal; Academic Institution

PS3-17

E-REFERRALS FOR TOBACCO CESSATION TO THE MARYLAND QUITLINE

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Significance: In the University of Maryland Medical System (UMMS) service area of 11 county and city jurisdictions, cigarette use by adult smokers is 16.7%. The UMMS tobacco cessation e-referral process addresses a major public health issue and overcomes the challenge for providers to create links between tobacco users and the Maryland Tobacco Quitline (MDQL). **Methods:** An e-referral pathway was implemented through the electronic health record (EHR), Epic, to connect UMMS patients to the MDQL and to reduce barriers to coaching and pharmacologic therapy for tobacco cessation. The 125 primary and specialty UMMS clinics that use Epic were selected for participation. **Results:** Between December 2017 and June 2019, 1,171 patients were successfully e-referred to the MDQL. Primary care providers made 671 (57%) e-referrals, while specialists made 400 (43%) e-referrals. Among specialists, Cardiology, OB/GYN and Behavior specialists made the majority of e-referrals (31%, 21% and 15% respectively). During the process of implementation, 28 "champion" practitioners emerged across all departments who referred more than 10 patients each, with 659 (56%) of all successful e-referrals made by the "champions." **Conclusion:** The implementation of a system-wide tobacco e-referral tool was successful in increasing tobacco cessation referrals to the MDQL. This tool provided a new opportunity for tobacco cessation counseling and referral to the MDQL ultimately resulting in increased access to quitting attempts by the tobacco users. Important factors for successful implementation of the e-referral process were continuous outreach to the UMMS leadership, knowledge dissemination about the e-referral process, introduction of systematic quality control for the process of data transmission through the HL7-V2 portal, and engaging "champion" providers

who actively used the EHR to refer patients and greatly enhanced dissemination efforts through the extended UMMS network. The Epic EHR e-referral pathway with closed loop communication can be replicated in other health systems.

FUNDING: State

PS3-18

THE RELATIONSHIP BETWEEN INTERNALIZED HIV/AIDS STIGMA AND SMOKING BEHAVIORS IN PEOPLE LIVING WITH HIV/AIDS

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INTRODUCTION: People living with HIV/AIDS (PLWHA) smoke cigarettes at a very high prevalence. PLWHA experience internalized HIV/AIDS stigma (IHAS) at high rates. Both smoking and IHAS are associated with negative health outcomes. This study is the first to examine the relationship between IHAS and smoking behaviors (i.e., smoking status, nicotine dependence, motivation to quit smoking) in a sample of US PLWHA. **METHODS:** 287 PLWHA at the Montefiore Center for Positive Living (Bronx, NY; 145 current smokers, 43.9% female, 55% Latina/o) completed a survey on psychological factors and smoking behaviors. IHAS was assessed using the Internalized AIDS-Related Stigma Scale (IARSS), smoking status was assessed via self-report and expired carbon monoxide levels. Nicotine dependence was assessed using the Fagerström Test for Nicotine Dependence, and motivation to quit was assessed using the Contemplation Ladder. The relationship between IHAS and each smoking behavior was examined using logistic regressions. Additional analyses adjusted for age, current marijuana use, and self-reported diagnosis of AIDS. **RESULTS:** There were no significant associations between IHAS, smoking status, nicotine dependence, and motivation to quit. However, for the individual IARSS item, "I sometimes feel worthless because I am HIV positive," current smokers were more likely to answer yes to the item compared to non-current smokers [χ^2 (1, n = 287) = 6.73, p < 0.01]. For item, "I hide my HIV status from others," non-current smokers were more likely to answer yes to the item compared to current smokers [χ^2 (1, n = 287) = 4.28, p = 0.04]. For IARSS item, "I feel guilty that I am HIV positive," smokers with high nicotine dependence were more likely to answer yes to the item compared to smokers with low ND [χ^2 (1, n = 145) = 4.45, p = 0.04]. **CONCLUSIONS:** While overall IHAS was not associated with smoking variables, some specific aspects of IHAS were. Given the high rate of smoking and IHAS experienced by PLWHA, research on other barriers to optimal smoking outcomes in PLWHA is needed.

FUNDING: Federal; Academic Institution

PS3-19

NICOTINE METABOLITE RATIO GUIDANCE FOR SELECTION OF TOBACCO TREATMENT MEDICATIONS IN RELAPERS

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SIGNIFICANCE: Tobacco dependence pharmacotherapy selection is more formulary and protocol driven than precision medicine based. Recent studies suggest that the nicotine metabolite ratio (NMR) can be used to guide therapy as fast metabolizers and slow metabolizers respond better to varenicline and nicotine replacement therapy (NRT), respectively. We have reviewed patients with prior failed treatments to evaluate the utility of NMR in retreatment to potentially increase effectiveness and save costs. **METHODS:** The NMR data was originally collected from 34 Veterans at the Loma Linda Veterans Affairs Tobacco Dependence clinic who failed previous therapy from February 2019 to August 2019. We collected quit dates, psychiatric comorbidities, Fagerstrom scores, American College of Chest Physicians Step scores (ACCP score 0-4), and substance abuse history. Patients were evaluated for eligibility in treatment change after NMR results and were notified to make follow-up appointments. **RESULTS:** The NMR range was 0.08-0.97, with a mean of 0.38. Slow metabolizers (NMR at or below 0.31) comprised 50% (17/34) of Veterans, medium metabolizers (NMR 0.32-0.59) made up 32% (11/34) of Veterans, and fast metabolizers (NMR at or above 0.6) made up 18% (6/34) of Veterans in the study. Veterans with psychiatric comorbidities made up 71% (24/34) of the patients, while 47% (16/34) had a substance abuse disorder. The mean Fagerstrom and ACCP Step scores were 6 and 3, respectively, indicating a moderate-severe nicotine dependence. About 50% of Veterans (17/34) were able to be followed and notified of their NMR results by August 2019. We found that 53% of patients (9/17) who were notified of their NMR results set a quit date. Among the patients notified of their NMR, 88% (15/17) of the patients had their medications



modified. To date, 82% (14/17) of patients were on suggested medications based on NMR results. **CONCLUSION:** The NMR assessment is a biological criterion to assist clinicians to initially select physiologically appropriate medications, a potential addition to precision medicine. If our initial selection was modified by NMR results 82% of the time after relapse event, we need to review our previous standard medication selection protocol based on USPHS guidelines.

FUNDING: Unfunded; Academic Institution

PS3-20

VERY LOW-NICOTINE CIGARETTES REDUCES CRAVING AND WITHDRAWAL WITH NO COMPENSATORY SMOKING OR HARMFUL EFFECTS ON SUBSTANCE USE AMONG SMOKERS WITH SUD

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Background: Very-low nicotine content cigarettes (VLNCC) reduced craving and withdrawal with little/no compensatory smoking among smokers in general. A mandated reduction in the nicotine yield of cigarettes may be a method of reducing smoking-related disease in special populations resistant to quitting smoking, such as people with substance use disorders (SUD). Our focus is to determine if VLNCC increases substance use or compensatory smoking in smokers with SUD. **Methods:** Smokers unmotivated to quit, with current SUD diagnoses, recruited from the community are randomized to VLNCC or normal nicotine content (NNC) cigarettes for 6 weeks, with counseling/problem solving about using study product. **Assessments:** baseline, weekly for 6 weeks, and 3 and 6-months later. **Effects** are assessed on cigarettes smoked per day (CPD), nicotine dependence, heavy drinking, drug use, and substance cravings. **Results:** So far, N=168 in intent-to-treat (target = 190), 137 have 6-week data entered, 103 have 3 & 6 month data. Most (89%) still used study cigarettes at 6 weeks per the ratio of cotinine/CPD. Across the experimental period, smoking urges, nicotine withdrawal, and nicotine dependence decreased similarly for VLNCC and NCC conditions ($p < .002$ for time), with no effect on cravings for drugs or alcohol. CPD decreased over the 6 weeks only in the VLNCC condition (interaction $p < .013$). VLNCC effects on CPD were greater with menthol use while sex did not moderate any effects. At follow-ups, conditions did not differ on percent heavy drinking days, but drug use days reduced more after VLNCC than NNC (interaction $p < .03$). **Conclusions:** Use of VLNCC vs. NNC did not result in compensatory smoking, increased frequency of substance cravings or more heavy drinking days. Drug use days decreased more after VLNCC compared to NNC cigarettes. Thus, VLNCC appear to have no harmful effects on substance use in smokers with current SUD. **Relevance to CTP Regulatory Authorities:** Effects on vulnerable populations of a proposed new product

FUNDING: Federal

PS3-21

IMPLEMENTATION RESEARCH ON TOBACCO TREATMENT IN THE VETERANS HEALTH ADMINISTRATION: A SCOPING REVIEW

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Significance: Veterans consistently use tobacco at higher rates than the general population. The Veterans Health Administration (VA) has a long-standing commitment to implementation science, which seeks to improve healthcare by promoting the uptake of evidence-based interventions into routine clinical practice. Summarizing VA tobacco treatment implementation research can help identify successful implementation practices that can be applied both within and outside of the VA. **Methods:** We conducted a systematic search of PubMed, PsycInfo, and CINAHL databases for articles published prior to March 2019. Articles were included if they reported on VA tobacco treatment interventions and evaluated at least one outcome from Proctor's framework for implementation outcomes. Included articles were coded according to the Population, Intervention, Comparison, Outcome (PICO) framework and implementation strategies, barriers, facilitators, and outcomes were identified. Implementation strategies were categorized by Waltz's mapping of the Expert Recommendations for Implementing Change. **Results:** We identified 23 articles reporting on 19 studies. Study settings included inpatient units (n=4), post-traumatic stress disorder clinics (n=4), and primary care (n=3). Frequently reported implementation strategies included use of evaluative and iterative strategies (n=10) and stakeholder training and education (n=10). Perceived implementation facilitators included intervention characteristics (e.g. low complexity), tools (e.g. EHR templates, protocols), and training and education. Common barriers

were lack of time, lack of resources, and perceived patient disinterest in cessation. All implementation outcomes were represented, with the most articles reporting fidelity (n=12) and reach/penetration (n=9). **Discussion:** This review highlights the multitude of available implementation strategies along with their respective facilitators and barriers. These findings can be used by clinicians and administrators to identify strategies to promote tobacco treatment and anticipate implementation obstacles. Further understanding of these factors will ultimately increase effectiveness of tobacco treatment in the VA.

FUNDING: Unfunded

PS3-22

COMPARING THE EFFECTIVENESS OF GENERALIZED VS. TAILORED IMPLEMENTATION STRATEGIES TO SUPPORT THE INTEGRATION OF MOOD MANAGEMENT INTO SMOKING CESSATION PROGRAMMING IN PRIMARY CARE

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Significance: Individuals with depression are almost twice as likely to smoke and have lower long-term abstinence when quitting smoking. Integrating a mood management (MM) component within standard smoking cessation treatment improves long-term abstinence among smokers with both current and past depression. However, it remains unclear which implementation strategies are most effective for mobilizing this knowledge into primary care settings. **Methods:** Ontario Family Health Teams (FHTs) (n=123) participating in the Smoking Treatment for Ontario Patients (STOP) program were randomly allocated 1:1 to receive generalized monthly emails related to smoking and depression (Group A), or a personalized knowledge broker offering tailored support (Group B), to encourage the delivery of a MM intervention. All healthcare providers were granted access to an integrated care pathway within the STOP online portal to help screen patients, in English, for past diagnosis and/or current depression (using the Patient Health Questionnaire [PHQ-9] score ≥ 5), and prompt the delivery of a brief intervention and MM resource. The primary outcome, measured at the FHT level, was the proportion of eligible enrollments that resulted in the provision of a MM resource to eligible patients. **Results:** Between February 2018 and January 2019, 7,163 smokers were screened for depression and 2,761 (39%) reported current/past depression. Among those who reported current/past depression, 983 smokers (36%) were offered a self-help MM resource. 783 (80%) of the patients who were offered a resource, accepted it. Adjusted regression analyses of 2,759 participants with complete covariate data showed there was no significant between group difference in the odds of participants accepting the MM resource (OR=0.91, 95% CI: 0.59-1.42). **Conclusion:** The results suggest that both implementation strategies are equally effective for encouraging the delivery of evidence-based mood interventions, as part of smoking cessation programs in primary care settings. The cost effectiveness of the two options and their long-term benefits at six months need further evaluation prior to any implementation of large scale-up programs.

FUNDING: Federal

PS3-23

THE ROLE OF FAMILY MEDICINE IN BEHAVIORAL HEALTH AND CESSATION

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Significance: The American Academy of Family Physicians (AAFP) is committed to providing family physicians the tools and resources needed to address tobacco use and nicotine dependence. Family physicians are on the frontlines of primary care and are well-equipped to provide many mental health services; most people with behavioral health conditions are diagnosed in the primary care setting. Tobacco use among adults with behavioral health conditions is astronomically higher when compared to tobacco use among adults without behavioral health conditions. Subsequently, 70% of people who use tobacco products visit a physician each year and are more likely to quit when encouraged by their doctor. Addressing this disparity is essential to reducing the leading cause of death in the United States. **Methods and Results:** Data from several recent Continuing Medical Education (CME) Needs Assessments surveys indicate family physicians have statistically significant and meaningful gaps in the medical skills necessary to provide optimal smoking cessation and tobacco-use prevention management. AAFP developed a comprehensive strategy to address this knowledge gap, including office-based quality improvement tools, point-of-care resources, patient education, physician education and CME. During the September 2019 Family Medicine Experience (FMX) Annual Meeting,



AAFP will evaluate the knowledge gained by learners in a pre- and post-survey after two CME sessions covering cessation in adults with behavioral health disorders. **Conclusion:** Family physicians are primed to address mental health and cessation, however clear knowledge gaps exist. The AAFP will continue to evaluate family physician knowledge and medical skills to promote the importance of cessation in adults with mental health conditions.

FUNDING: Pharmaceutical Industry; Academic Institution

PS3-24

IMPULSIVITY DIFFERENCES BETWEEN EARLY AND LATE INITIATORS OF FREQUENT MARIJUANA USE

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Background: Delta 9-tetrahydrocannabinol (THC) may increase impulsivity via the cannabinoid receptors located in the prefrontal cortex. Research suggests that early and late initiation of MJ use differentially impacts the neurobiology that regulates executive functioning. We hypothesized that early initiators (EI) (16 y.o. or younger) of regular MJ use, 4 days/wk or greater, would be more impulsive than late initiators (LI) (17 y.o. or older). **Methods:** This work is a secondary analysis of a parent study that recruited MJ users interested in cessation. At screening, EI (n=33) and LI (n=30) completed self-reported measures of impulsivity including BAS Scale and BSCS. **Results:** There were non-linear relationships between BSCS, BAS-Fun Seeking (BAS-FS), and BAS-Drive (BAS-D) scores and age of initiation (p<0.05). The data was stratified using the hypothesized cutoffs and analyzed to look for differences in the magnitude and direction of the estimates for these outcomes between the groups. Among EI, there was a negative linear relationship between age of initiation and BSCS scores. Decreasing BSCS scores marks decreasing self control. Among LI, there was a negative linear relationship between age of initiation and BAS-FS scores; and a significant positive linear relationship between age of initiation and BSCS scores. A decrease in BAS-FS scores marks decreasing impulsivity regarding motivation to find novel rewards. Increasing BSCS scores marks increasing self control. On average, EI had lower BAS-D scores (10.9 SE: 2.01) compared to LI (12.0 SE: 2.38). Lower BAS-D scores among EI marks lower impulsivity regarding the pursuit of goals. **Conclusions:** Contrary to our hypothesis EI had lower impulsivity than LI. It is possible that the small sample size in this analysis was not capable of determining relevant differences in impulsivity. Additional studies with a larger sample size may reveal which facet of impulsivity is connected to frequent marijuana use at a younger age.

FUNDING: Federal

PS3-25

NASAL IMMUNIZATION INDUCES NICOTINE-NEUTRALIZING ANTIBODIES IN BLOOD AND LUNG MUCOSAL SECRETIONS

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Significance: The importance of this study is to test the feasibility of using a nasal nicotine vaccine candidate to induce nicotine-neutralizing antibodies in the blood and mucosal secretion. Anti-nicotine antibodies in the lung mucosal secretion are expected to neutralize nicotine and reduce its absorption from cigarette smoking. **Method:** Nicotine was chemically conjugated to keyhole limpet hemocyanin (KLH) protein using carbodiimide conjugation reaction. The resultant antigen (i.e. Nic-KLH) was admixed with an adjuvant (Adj) in phosphate-buffered saline (PBS). BALB/c mice were dosed nasally on days 0, 14, and 28. One month following the last dose, mice were euthanized to collect mucosal wash (lung and nose) as well as serum. Anti-nicotine (IgG and IgA) titers, affinity and specificity were determined using ELISA. **Results:** Nasal immunization with Nic-KLH/Adj elicited anti-nicotine IgG in mice, to a level comparable to that in mice subcutaneously injected with Nic-KLH/Adj. However, anti-nicotine sIgA response in mucosa was only induced in mice nasally dosed with Nic-KLH/Adj, not in mice subcutaneously injected with Nic-KLH/Adj. Competitive ELISA assay reveals that the anti-nicotine antibodies were able to neutralize nicotine. Additionally, anti-nicotine antibodies in the serum bind specifically to nicotine, but not to cotinine, the primary nicotine metabolite, nor acetylcholine, the endogenous neurotransmitter. **Conclusion:** Nasal immunization induced high level of nicotine-specific antibodies in the blood and mucosal secretion including lung and nasal lavage. Anti-nicotine antibodies in the mucosal secretions may help to reduce nicotine absorption from cigarette smoking.

FUNDING: Academic Institution

PS3-26

TOBACCO USE TREATMENT FOR PATIENTS WITH CANCER: SCALING TREATMENT THROUGH INTEGRATION OF HIT TOOLS WITHIN THE EHR

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Referral rates to an effective tobacco treatment program (TTP) remain low in patients undergoing cancer therapy despite reduced treatment efficacy and other adverse clinical outcomes among those who continue to use tobacco. To address this at the Oregon Health & Science University (OHSU) Knight Cancer Institute, we sought to implement a scalable approach to tobacco cessation that leverages the data and capabilities of the existing electronic health record (EHR). Specifically, we endeavored to: 1) establish standard clinical workflows to assess tobacco use status, 2) implement local updates in the EHR to enhance documentation of referral for tobacco cessation, and 3) integrate a closed loop referral to a tobacco quit line within the EHR. In addition, clinic staff received tobacco cessation training and were socialized to the EHR changes. We performed oncology clinic workflow assessments and interviews to better understand how team members ask (and record), advise, and address tobacco use. Input from oncology providers revealed the following: oncologists agree tobacco cessation is important, but lack training and resources, assessment of tobacco use is inconsistent by clinic and by provider type, and OHSU has limited cessation support resources available. We then coordinated with the Departments of Family Medicine and Cardiology to design a standardized tobacco cessation workflow. This workflow includes a documentation flowsheet to be implemented in the EHR, which, in addition to the discrete data captured in social history, documents additional features of tobacco use. To better track TTP referral outcomes, we integrated the Optum quit line closed referral system into our EHR. This system supports discrete data to file back into the EHR, allowing us to track individuals who have actively engaged with TTP and follow up with those who have not. Taken together, our approach demonstrates how with coordinated efforts we have implemented an EHR based tobacco cessation approach that reaches all cancer patients and that may be easily expanded across the hospital system to reach all patients.

FUNDING: Federal

PS3-27

FACTORS ASSOCIATED WITH MARIJUANA USE AMONG AFRICAN AMERICAN NONDAILY SMOKERS

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Introduction— Marijuana (MJ) and tobacco co-use is a growing concern in the US, especially among racial/ethnic minorities such as African Americans (AAs). Co-use increases the risk of developing nicotine dependence and poses negative health effects that exceed the harms of either substance individually. Despite decreasing numbers of daily smokers, nondaily smokers (NDS) are on the rise and make up 42.9% of US smokers. Alternative tobacco product use, including use of blunts, is higher in AA NDS than AA daily smokers, further accentuating the need to investigate co-use in this group. **Methods**— Baseline data from a randomized control trial of 262 AA adult NDS (cigarette use on 4-27 of the past 30 days) were analyzed to identify correlates of MJ use. Past 30-day MJ use was determined via Timeline Follow Back and a single-item baseline question. Logistic regression assessed the associations of demographic, smoking-related, and psychosocial variables with marijuana use. **Results**— Participants were 48.1 years old on average, 49.6% male, and 47.2% at or below 100% Federal Poverty Level. They smoked cigarettes on an average of 18 days of the last 30 and used 4.5 cigarettes on smoking days. Of the 262 AA NDS, 37.8% used MJ at baseline. Blunt users reported 7.4 days of use in the past 30, while users of non-blunt MJ reported 7.8 days of use. MJ use was associated with the use of alternative tobacco products (e.g., cigarillos, cigars) (OR= 2.11, CI: 1.18-3.77, p= 0.012), depressive symptoms (OR= 1.22, CI: 1.05-1.42, p= 0.011), and younger age (OR= 0.97, CI: 0.94-0.99, p = 0.004). Gender and alcohol misuse were also explored but were not significantly correlated with co-use. **Conclusions**— Rates of MJ and tobacco co-use in our sample far exceed the national rate, indicating that co-use may be higher in racial/ethnic minorities and light/intermittent smokers. Co-use poses harmful health effects that exceed the risk of either substance alone and decreases the likelihood of smoking cessation, making it essential to better understand and address co-use, especially in vulnerable populations. Findings suggest the need to address MJ use within the context of tobacco cessation treatment.

FUNDING: Federal



PS3-28

E-CIGARETTE USE AND HEALTH-RELATED CORRELATES OF E-CIGARETTE USE AMONG U.S. COLLEGE STUDENTS IN 2015 AND 2018

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Significance: E-cigarette use in the U.S. is rapidly increasing, particularly among college students. Prior research has shown that combustible tobacco is correlated with a higher prevalence of negative health correlates and this could exist for e-cigarette users as well. The purpose of the current study is to determine the change in e-cigarette use between 2015 and 2018 and health-related correlates of e-cigarette use among U.S. college students. **Methods:** The American College Health Association's National College Health Assessment is a cross-sectional survey that assesses college student health across multiple U.S. institutions. This survey includes multiple-choice demographic and health-related questions. Data was obtained from 40 different participating institutions in Fall 2015 (N=19,861) and Fall 2018 (N=26,181). We used logistic regression to analyze the health-related correlates of combustible tobacco, other substance use, and mental health on e-cigarette use. **Results:** E-cigarette use in college students increased by 340% from 2015-2018. In 2015, the odds of being an e-cigarette user (n=956), compared to a non-user (n=18,708), was higher if they used combustible tobacco (OR=7.3, 95% CI: 6.2-8.6), other substances (OR=1.5, 95% CI: 1.2-1.8), or had a recent binge drinking episode (OR=1.3 95% CI: 1.1-1.6). In 2018, the odds of being an e-cigarette user (n=3,243), compared to a nonuser (n=21,977), was higher if they used tobacco (OR=5.0, 95% CI: 4.5-5.5), other substances (OR=2.0, 95% CI: 1.7-2.4), had a recent binge drinking episode (OR=3.2 95% CI: 2.9-3.5), or had an ADHD diagnosis (OR=1.4 95% CI: 1.2-1.7). **Conclusion:** While the types of risk factors have remained the same from 2015-2018, the likelihood of e-cigarette use among college students has increased for binge drinkers and other substances users, and has decreased for combustible tobacco users. As prevalence of e-cigarette use increases, observing changes in e-cigarette correlates is important to understand future use of e-cigarettes and how it may differ from other products, particularly as combustible tobacco use decreases.

FUNDING: Unfunded

PS3-29

ACUTE EFFECTS OF INHALED MENTHOL ON COGNITIVE EFFECTS OF INTRAVENOUS NICOTINE AMONG YOUNG ADULT CIGARETTE SMOKERS

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Significance: Basic science studies indicate that menthol can enhance the cognitive effects of nicotine to contribute to increasing nicotine dependence. However, the effect of menthol on cognitive performance among humans has yet to be studied. This double-blind, placebo controlled study examined whether menthol inhaled from an e-cigarette would impact the cognitive effects of nicotine among young adult smokers. **Methods:** Twenty menthol (MS) and 18 non-menthol (NMS) cigarette smokers (21% female, 50% White, age M=24.7, 12.2±5.9 cigarettes/day) completed 3 randomized test sessions with different inhaled menthol conditions (0.0%, low/0.5%, and high/3.2%). During each session, a random order of three I.V. nicotine conditions (saline/0.0mg, low/0.25mg, high/0.5mg) were administered 1 hour apart alongside with the e-cigarette menthol inhalation. After each administration, participants completed 3 cognitive tasks including Continuous Performance (CPT; sustained attention), Mathematical Processing (MPT; working memory), and Stroop (Word, Color, Color-Word; response inhibition) tasks. Outcomes included percent of correct and incorrect responses, response time (RT), and efficiency. A mixed effects model examined between-subject effects of cigarette type and within-subject effects of menthol and nicotine dose. **Results:** In general, participants improved in efficiency and RT across sessions and time points. MS smokers also tended to perform worse on the CPT and MPT, and had lower efficiency scores for the Color-Word Block of the Stroop task. Significant nicotine x menthol interactions were found only during the Stroop Color Block, where participants performed better (i.e., higher % of correct and lower % of incorrect responses) for high compared to saline dose of I.V. nicotine during the day of low dose of inhaled menthol. Participants also had a lower % of incorrect responses for low compared to saline dose of I.V. nicotine during the day of low dose of inhaled menthol. **Conclusion:** Results suggest there may

be cognitive implications from smoking menthol vs. non-menthol cigarettes as well as potential cognitive differences based on the varying level of menthol/nicotine content in nicotine products.

FUNDING: Federal

PS3-30

VARENICLINE TREATMENT DOES NOT IMPACT SELF-REPORTED QUALITY OF LIFE FOR CANCER PATIENTS ENROLLED IN A PLACEBO-CONTROLLED RANDOMIZED SMOKING CESSATION CLINICAL TRIAL

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Significance: Despite the association between smoking and poorer cancer-related outcomes, half of cancer patients who were smoking prior to diagnosis still continue to do so. While continued smoking is associated with lower self-reported quality of life in the general population, few studies have examined the impact of smoking cessation on quality of life among a broad group of cancer patients taking varenicline. **Methods:** A placebo-controlled, randomized clinical trial evaluated standard 12 weeks vs. extended 24 weeks of varenicline for cancer patients who smoke (N=207). Primary outcome was 7-day, biochemically confirmed (CO<10), smoking abstinence at week 24. Participants also self-reported on quality of life (physical, emotional, & total) using the Short-Form Health Survey (SF-12) at weeks 1 (pre-quit), 3 (target quit date), 12, and 24 (end of treatment) of the study. **Results:** Participants who completed all four sessions (n=101, 50% female, 70% White, age M=60.4, 14.0±7.9 cigarettes/day) were analyzed using a within subject repeated measures comparison of varenicline treatment arm (51% randomized to extended treatment), week 24 quit status (57% abstinent), and currently on cancer treatment (42% active) on self-reported quality of life at each timepoint. Results showed that quality of life scores were significantly different by week 24 quit status (Wilks' $\lambda=0.92$, F(3, 95)=2.81, p<.05), but not by treatment arm or cancer treatment status (p>.05). However, after accounting for covariates which were significantly associated with quit status (employment status, nicotine dependence), quality of life scores were no longer significantly different by quit status (p>.05). **Conclusions:** Although varenicline is considered first line for pharmacological treatments for smoking cessation, many health care providers and patients are concerned about the potential negative impact of taking varenicline on cancer patients' quality of life, particularly during cancer treatment. However, our findings suggest that varenicline does not adversely affect quality of life among cancer patients, and further strengthens the support for extended varenicline use among cancer patients to optimize their smoking cessation outcomes.

FUNDING: Federal

PS3-31

RECRUITMENT OF LONG-TERM, OLDER SMOKERS TO SMOKING CESSATION TRIALS IN THE LUNG SCREENING SETTING: UNDERSTANDING WHO IS DECLINING PARTICIPATION & WHY

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Significance: The NCI's Smoking Cessation at Lung Examination (SCALE) Collaboration includes 8 ongoing randomized cessation trials. The trials were designed with the goal of increasing cessation among the 4 million current smokers in the U.S. who are eligible for lung cancer screening (LCS) (> 30 pack years, 55-80 years old). In an effort to increase the reach of these trials among older,



long-term smokers, we assessed the reasons for refusing enrollment and associations with demographic characteristics, recruitment method, and intervention type. **Methods:** Study recruitment methods (e.g., phone, in-person, on-line, email, mail) and intervention type (e.g., combination of quitline, pharmacotherapy, telephone, video-based, and in-person counseling) vary in the SCALE trials. We analyzed descriptive data of study decliners and their reasons for not participating from 7 of the SCALE trials. **Results:** To date, of the 6223 patients found study eligible at screening (average age = 63.2 years old, 46% female, 11.2% non-white, and 5.5% Hispanic), 3330 declined study participation and 2893 enrolled (46.5%). Participants and decliners did not differ on these demographic characteristics. In-person enrollment yielded higher participation than phone enrollment (mean = 65.5%, range: 19-79% vs. mean = 31.8%, range: 26-33%, respectively). Reasons for declining included: no time/not interested (40.0%), passive decline (32.2%), prefers a different cessation method (6.6%), not interested in participating in research (5.1%), not ready to quit smoking (5.1%), not interested in intervention provided (e.g., NRT, counseling (1.8%), health issues (1.6%), other (2.8%), and missing (4.8%). About half of all decliners were women (46%); women were more likely than men to cite not wanting to participate in research (54%) or health issues (59.8%) as reasons for declining. Of those declining because of not wanting to participate in research, 21.4% were Hispanic, which is more than 3X their representation in the study (6.3%). The distribution of reasons for refusal varied by trial yet there was not a clear relationship to intervention type. **Conclusion:** Expanding the reach of smoking cessation trials may involve increasing in-person accrual, and addressing concerns about research participation, particularly for women and ethnic minorities. While LCS programs and associated cessation interventions may help individuals stop smoking, there are still barriers that need to be addressed to increase the number of smokers who receive evidence-based tobacco treatment.

FUNDING: Federal

PS3-32

COMPARISON OF SALIVA NICALERT VS. CARBON MONOXIDE RESULTS AMONG SELF-REPORTED FORMER SMOKERS IN A CESSATION TRIAL FOR LONG-TERM, OLDER SMOKERS

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Significance: Recent literature suggests that Nymox Saliva NicAlert® test strips exhibit similar validity, sensitivity and specificity when compared to expired carbon monoxide (CO) as biomarkers of smoking. However, questions have arisen regarding the NicAlert test's accuracy. Our objective was to measure the concordance between NicAlert and coVita piCO+ Smokerlyzer CO monitor test results for self-reported former smokers participating in a cessation trial. **Methods:** Data were collected from an ongoing SCALE (Smoking Cessation at Lung Examination) randomized cessation trial at 3-, 6- and 12-months post-randomization. Participants reporting 7 day point prevalence abstinence were eligible to complete dual biochemical verification if they were not using NRT, e-cigarettes, combustible tobacco products, or marijuana. The tests were conducted on the same day and in person by site coordinators, at one of 4 lung screening sites, and participants were eligible to complete both tests at more than one time point (e.g., at 3- and 6-months). We used a cutoff of 0 (0-10 ng/ml) for NicAlert and ≤ 6 ppm for CO to indicate abstinence. **Results:** Participants completing dual biochemical verification (n=16) were 63.4 years old (SD=6.6), 68.8% female, 93.8% White, and 18.8% Hispanic. A total of 19 dual tests were completed: 73.7% (14/19) were confirmed former smokers by both tests, and 26.3% (5/19) of the results were discordant, with the CO ≤ 6 ppm (former smoker), and the NicAlert ≥ 1 (current smoker). Kappa could not be computed due to two zero cells. Tests were conducted M=153.5 days (SD=88.0) after self-reported quit dates. Participants were paid \$50 for completing both tests. **Conclusion:** Although this was a small sample of participants completing dual biochemical verification, the 26% discordance calls into question the accuracy of the NicAlert saliva strip compared to the CO test. Additional work is needed to confirm these results given the importance of precise biochemical confirmation in assessing abstinence in RCTs. Although human error is possible, it is unlikely that incorrect testing practices

would be replicated across multiple sites as conducted in this trial. While practical and cost-effective, further testing of NicAlert against other biochemical verification methods is needed.

FUNDING: Federal

PS3-34

THE ASSOCIATION OF TOBACCO SMOKE EXPOSURE AND INFLAMMATORY MARKERS IN HOSPITALIZED CHILDREN

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Significance: Children who are involuntarily exposed to tobacco smoke are at increased risk for respiratory and infectious illnesses. Tobacco smoke exposure (TSE) affects the immune system of children as measured by altered cytokine levels. Our objective was to examine TSE prevalence and the relationship between TSE and cytokine levels in hospitalized children. **Methods:** We prospectively enrolled N=199 hospitalized children 0-17 years old of which 112 (56.3%) had sufficient saliva volume for biological assays. Inflammatory markers (IL-8, IL-1 β , IL-10, and TNF- α) and cotinine were measured in saliva using enzyme-linked immunosorbent assays. To assess the association between TSE and immune system response, we built a multivariate regression model including the four inflammatory markers as the response variables and cotinine, age, sex, and discharge diagnosis as explanatory variables while assessing possible interaction effects. **Results:** Mean age (SD) was 5.8(5.0) years; cotinine levels ranged from 0.075ng/ml to 29.2ng/ml; Geometric Mean (GeoM)=1.7 [95%CI=1.4-2.2]. Children with non-inflammatory other diagnoses had lower IL-10 ($p=0.003$) and TNF- α ($p=0.009$) levels than children with inflammatory other diagnoses. Children with asthma ($p=0.01$) or bacterial illnesses and/or pneumonia ($p=0.002$) had higher IL-8 levels. Independent of diagnosis, there was a significant curvilinear association between cotinine and IL-1 β (linear term $\beta^A=-1.12$, $p=0.024$, quadratic term $\beta^A=1.14$, $p=0.002$) reflecting no association for cotinine levels <5 ng/ml and a positive association for >5 ng/ml. No differences were found between cotinine and IL-10, IL-8, and TNF- α . **Conclusions:** Hospitalized children with higher TSE levels have higher levels of IL-1 β regardless of age, sex, and diagnosis. TSE may increase pro-inflammatory immune responses in children and may interfere with native immune responses and the ability to heal and fight infection. Further research is warranted to further explore the role of TSE on the immune system.

FUNDING: Federal; State

PS3-36

CLINICIAN AND PATIENT PERSPECTIVES ON A MULTI-LEVEL TOBACCO USE TREATMENT INTERVENTION FOR CANCER PATIENTS - A MIXED-METHODS STUDY

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Background: Cancer survivors who use tobacco face higher risk of poor outcomes and additional primary cancers. While clinical guidelines recommend routine screening and referral to tobacco use treatment (TUT), demands of cancer care create barriers to following these practices. We studied clinician and patient perspectives of a multi-level intervention that includes: (1) mhealth-based cognitive behavioral therapy (mCBT), telephone counseling, or in-person group counseling; (2) an electronic health record (EHR)-based TUT referral system; and (3) strategies to link clinics with a state-funded TUT program. **Methods:** We used mixed-methods to understand perceived barriers and facilitators to implementing the intervention in local settings. Focus groups with providers and staff in oncology clinics were conducted before implementation (n = 14). Qualitative interviews with 15 physicians in oncology clinics were conducted after the EHR-based referral system was implemented. Structured surveys with patients were conducted at baseline (n = 89) and 12 weeks (n = 22). **Findings:** Focus groups revealed concerns about low capacity for screening patients and limited space for in-person counseling. In qualitative interviews, physicians supported TUT interventions for cancer patients, but considered the EHR-based referral system burdensome. Physicians preferred sending lists of patients who use tobacco to the state-funded TUT program, which would not interrupt clinical workflow. Timing of in-person counseling depended on the patient's stage of recovery, as recently diagnosed patients may be less receptive to counseling. Data on patient acceptability of treatment options complement these findings. Most patients (80%) opted for mCBT or telephone counseling, which nearly two-thirds (>60%) chose because it was convenient and could be done from home. **Discussion:** This study



demonstrates the acceptability of an evidence-based, multi-level TUT intervention from the perspective of clinicians and patients, and points toward refinements to facilitate its use in cancer care settings. Findings reveal opportunities to address barriers related to clinic space, workflow, and patient-level factors.

FUNDING: Academic Institution

PS3-37

GENETIC VARIATION IN THE CHRNA4 NICOTINIC RECEPTOR SUBUNIT MAY INFLUENCE RESPONSE TO VARENICLINE

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Significance: Varenicline is a partial agonist at the $\alpha 4\beta 2$ nicotinic acetylcholine receptors. A variant (rs2236196; A>G) within *CHRNA4* (encoding the $\alpha 4$ subunit) was previously associated with abstinence on varenicline (King et al., 2012). We examined this association in an independent sample and assessed potential underlying mechanisms. **Methods:** We tested associations between rs2236196 and biochemically-verified abstinence (exhaled CO ≤ 8 ppm) at Weeks 2, 12 (End-of-Treatment), and 26 (6-month follow-up) within the varenicline arm (N=220 Caucasians) of a smoking cessation trial (NCT01314001). We also evaluated genotype group differences in baseline smoking characteristics, adverse effects, and adherence within the varenicline arm, as well as abstinence in the placebo arm (N=212). **Results:** The AA group (N=116) had higher abstinence rates than the A/G group (N=83) at Week 2 (OR=1.9, 95%CI 1.0-3.5, p=0.05); a similar direction of effect was observed at Week 12 (OR=1.5, 95%CI 0.8-2.7, p=0.23) and Week 26 (OR=1.7, 95%CI 0.9-3.5, p=0.12). The GG group was too small to evaluate (N=21) but showed similar trends towards lower abstinence. Between the AA and AG genotype groups, there were no differences in baseline dependence scores (p=0.32), daily cigarette consumption (p=0.30), incidence of adverse effects (p>0.05), or in abstinence on placebo (3 visits, p>0.36). There was a suggestion of higher adherence among AA than AG (defined by ≥ 1 ng/mL salivary varenicline levels at Week 2; OR=2.0, 95%CI 0.8-5.0, p=0.15). Among those adherent, AA had higher quit rates vs. AG at Week 2 (OR=3.5, 95%CI 1.5-8.4, p<0.01), which was not observed in non-adherent individuals (p=0.88; genotype-by-adherence interaction on cessation at Week 2: ORR=6.7, 95%CI 1.0-47.2, p=0.06). **Conclusion:** Variation in the $\alpha 4$ nicotinic receptor subunit alters response to varenicline, where rs2236196 AA genotype showed higher early abstinence rates vs. AG. In contrast, there were no genotype differences in baseline smoking, adverse effects, or placebo response, suggesting this variation did not alter smoking behaviours or general cessation, but may be due, at least in part, to an influence on adherence.

FUNDING: Federal; State; Academic Institution; Other

PS3-38

IS TOOTH STAIN REDUCTION A MOTIVATING FACTOR IN NICOTINE REPLACEMENT GUM THERAPY AMONG MODERATELY DEPENDENT CIGARETTE SMOKERS

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Significance: Though cigarette smoking is associated with a variety of negative health care effects, tooth staining and halitosis are few reversible complications associated with the aesthetic perception of the users, making them an important motivational factor in tobacco cessation practices. Nicotine Replacement Therapy (NRT) gums has been traditionally used for moderately dependent smokers to facilitate the transition from smoking to abstinence. The aim of this study was to assess whether quit rates were better with a tooth whitener based NRT gum compared to that of a plain NRT gum among a group of bus drivers who were moderately dependent to cigarette smoking. **Methods:** This interventional study was conducted among sixty bus drivers who were current cigarette smokers with a mean use of 5.3 cigarettes per day for a duration of 9.4 years. The study participants were divided into two arms, with the interventional group being administered a sodium bicarbonate based tooth whitener containing NRT gum, while the control group being administered plain NRT gum, after regular tobacco cessation advices. The outcome variable assessed were tooth staining based on the modified Lobene index and subjective assessment of smoking frequency, quit and relapse rate at baseline and 6 weeks after cessation therapy. **Results:** At the end of study duration, the mean tooth stain index was reduced significantly in the interventional group from 2.4 to 1.2 (p<0.05, Mann Whitney U Test), while there was no difference in the control group. Self reported complete abstinence was reported among 7 and 5

in the intervention and control groups respectively. Both quit and relapse rates were statistically insignificant between both the groups. **Conclusion:** Though the subjects of this study demonstrated a significant reduction in tooth staining with a tooth whitener based NRT gum, its relevance as an additional motivating factor for smoking cessation is questionable.

PS3-39

IMPLEMENTATION OF TOBACCO TREATMENT FOR CANCER PATIENTS: A PILOT STUDY

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Significance: Continued tobacco use among cancer survivors reduces the effectiveness of cancer treatments and is associated with increased overall and cancer-specific mortality, increased risk for recurrence, and diminished quality of life. The major professional and advocacy groups in oncology recommend routine assessment of tobacco use and provision of tobacco use treatment (TUT). Due to the competing demands of complex cancer care, however, cancer centers are challenged with implementing strategies that both assess tobacco use and connect patients with TUT services. **Methods:** We investigated the feasibility of implementing strategies to improve access and utilization of TUT for cancer patients. Tobacco users were identified in oncology clinics at a large academic health center and were enrolled in TUT using the opt-out approach and electronic referral. Patients chose either a dedicated mhealth cognitive behavioral therapy (mCBT) program or referral to existing state-funded TUT programs (i.e. quitline, group counseling). The mCBT arm comprised 6 weekly sessions with a tobacco treatment specialist via smartphone video conferencing. Outcomes at 12 weeks included 7-day point prevalence of smoking, cigarettes per day, and treatment acceptability ratings. **Findings:** We enrolled 89 patients, with 52 (58.4%) choosing existing TUT and 37 (41.6%) choosing mCBT. Among mCBT patients, 7 (18.9%) initiated treatment and 5 (13.5%) completed full treatment. Among existing TUT patients completing follow-up (n=14), 7 (50.0%) received TUT. The mean change in cigarettes per day among patients completing follow-up was -2.4 in mCBT (n=8) and -5.8 in existing TUT (n=14), with 2 existing TUT and 2 mCBT patients reporting abstinence. The mean treatment acceptability rating (0-1) was 0.72 for mCBT and 0.57 for existing TUT, with mCBT scoring higher on several items: interesting treatment, easy to understand, availability, and flexibility. **Conclusions:** This research demonstrates the feasibility of strategies to facilitate the widespread adoption and implementation of evidence-based tobacco use treatments in cancer care settings. Opportunities exist for improving reach and engagement.

FUNDING: Academic Institution

PS3-40

EXPLORING THE IMPORTANCE OF THE COMPONENTS OF A SMOKING CESSATION PROGRAM FOR VETERANS WITH SERIOUS MENTAL ILLNESS (SMI)

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Significance: Smoking programs targeting SMI smokers often include multiple components: education, outreach, motivational enhancement, skills building, and pharmacological options (eg, medications and/or nicotine replacement therapy (NRT)). We examined data from an RCT of smoking cessation interventions for SMI smokers to explore whether some treatment components were more likely to promote engagement and change in smoking. **Methods:** SMI smokers (N=178) recruited from outpatient mental health programs at three VA Medical Centers were randomized to a motivational/behavioral (N=91) or a supportive (N=87) intervention. All participants were offered 24 group meetings, six weeks of active outreach, education about quitting, and education about and ongoing offers to assist with obtaining medications/NRT. **Results:** The sample was 89.3% male and 70.8% African-American with a mean age of 54.8 (SD=7.2). Participants smoked an average of 15.2 cigarettes/day at baseline (SD=9.8). Participants attended a mean of 9.3 group sessions (SD= 7.8), completed a mean of 3.7 outreach contacts (SD= 3.0), and were exposed to a mean of 1.8 (SD=1.2) medication education sessions; 72 (47.4%) used cessation medications/NRT. Those in the motivational/behavioral condition attended more group meetings and were more likely to use cessation medications/NRT. Overall, 11.8% of the total sample reported smoking abstinence at post-treatment and 72.7% made a quit attempt during treatment. In addition, 87% made a major change in their level of smoking (defined as reducing smoking by at least 50% from baseline to post treatment). Analyses currently underway will examine the extent to which involvement in the different components of these



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programs were more or less related to making a major change in the level of smoking. Conclusions: SMI smokers will participate in multicomponent cessation interventions and make use of what these programs have to offer. Motivational/behavioral interventions may be associated with slightly higher use of different types of intervention components. Additional analyses will allow us to examine whether use of different components is associated with reductions in smoking.

FUNDING: Federal

PS3-41

AXS-05 (DEXTROMETHORPHAN AND BUPROPION) FOR THE TREATMENT OF TOBACCO USE: SIDE EFFECTS DO NOT APPEAR TO IMPACT ADHERENCE OR SMOKING

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Background: Medication side effects commonly lead to decreased medication adherence and poorer treatment outcomes. All FDA-approved smoking cessation medications have potential side effects. For example, the nicotine patch can cause skin irritation; nicotine gum and lozenge can cause nausea; bupropion can cause dry mouth and insomnia; and varenicline can cause nausea and vivid dreams. Duke University and Axsome Therapeutics, Inc. recently collaborated to complete a trial on a new drug, AXS-05 (dextromethorphan and bupropion) for smoking cessation. An important consideration was whether treatment-emergent side effects reported by participants taking AXS-05 affected medication adherence or smoking outcomes. **Methods:** We conducted a randomized controlled trial of 58 adult daily smokers treated with AXS-05 or bupropion (BUP). Here, we report a secondary analysis on treatment-emergent side effects and their association with medication adherence and smoking reduction measured via self-reported cigarettes-per-day (CPD) and expired breath carbon monoxide (CO) over a 4-week period. **Results:** Treatment-emergent side effects were reported by seven (28%) AXS-05 participants and five (22%) BUP participants ($p=0.62$). Mean intensity of side effects was 3.70 (AXS-05) and 3.91 (BUP) on a 7-point severity scale ($p=0.27$). For participants taking AXS-05, side effects showed a non-significant association with increased medication adherence (98.44% (with side effects) vs. 95.74% (without side effects), $p=0.20$); a non-significant association with reduction in ad libitum smoking (8.87 CPD (with side effects) vs. 7.86 CPD (without side effects), $p=0.62$); and a non-significant association with CO (16.14 ppm (with side effects) vs. 11.28 ppm (without side effects), $p=0.52$). BUP side effects were found not to be associated with reduced medication adherence or treatment outcomes. **Conclusion:** AXS-05 appeared to be well tolerated in adult daily smokers, and side effects did not appear to be associated with decreased adherence or poorer smoking outcomes. Although results are promising, this was a small study with limited power, and a larger study would be needed to assess these relationships with greater certainty.

FUNDING: Pharmaceutical Industry

PS3-42

AXS-05 (DEXTROMETHORPHAN AND BUPROPION) IN HIGH DEPENDENCE SMOKERS

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Significance: AXS-05, a combination of dextromethorphan and bupropion (BUP) exhibits multiple activities that may reduce tobacco use, including antagonism of N-methyl-D-aspartate and alpha-3 beta-4 nicotine acetylcholine receptors. Duke University and Axsome Therapeutics, Inc. collaborated to study AXS-05 for reducing tobacco use. **Methods:** We conducted a study of 58 daily smokers randomized to either AXS-05 or BUP to assess change in ad libitum smoking over a 3-week period measured by self-reported cigarettes-per-day (CPD) and expired breath carbon monoxide (CO). Here, we report a secondary analysis on predictors of smoking reduction for AXS-05, including baseline Fagerström Test for Nicotine Dependence (FTND). **Results:** In AXS-05 participants, but not BUP participants, higher FTND scores were associated with greater reduction in smoking when assessed by CPD ($p = 0.035$) but not by CO ($p = 0.30$). Further exploration of AXS-05 subjects showed that CO followed an unexpected pattern over time, in which there was an increase in CO during week 1 that was then associated with a decrease in CO during weeks 2 and 3 ($p < 0.001$). This pattern of CO change was most notable in AXS-05 subjects with high FTND (> 5), who showed an average CO increase of 0.58 ppm in week 1; high-FTND BUP subjects decreased their CO by 8.4 ppm in week 1 ($p = 0.088$). During weeks 2 and 3, high-FTND AXS-05 participants showed a CO reduction of 12.67 ppm, whereas high-FTND BUP participants increased their CO by an average of only 0.4 ppm ($p = 0.002$). **Conclusion:** Compared

to BUP, AXS-05 appears to lead to greater smoking reduction in high-FTND smokers as well as a pattern of increased smoking during week 1, followed by decreased smoking in weeks 2 and 3. This pattern has also been found with varenicline use, in which decreased nicotinic reward may at first cause smokers to compensate by smoking more, but with continued use may lead to reward extinction with reduced smoking. Results suggest that AXS-05 appears to affect smoking differently than BUP and deserves further evaluation in a larger study.

FUNDING: Pharmaceutical Industry

PS3-43

INVESTIGATION OF OBSERVATIONAL DATA REGARDING "STANDARD-OF-CARE" TREATMENT IN THE DUKE SMOKING CESSATION PROGRAM

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Significance: The Duke Smoking Cessation Program (DSCP) is a network of 10 smoking cessation clinics in the North Carolina Research Triangle area staffed by medical providers who have been trained as Tobacco Treatment Specialists. DSCP clinics work within a research-based data collection infrastructure that includes algorithmic treatment protocols, uniform data collection, and assessment of biochemical and self-reported smoking. Data collected includes demographics, smoking history, financial and psychological variables, medication, and behavioral treatment. As with most clinical management, the timing and frequency of clinic visits are tailored to meet the needs of patients. Key outcomes include change in expired breath carbon monoxide (CO) during treatment and changes in motivation and smoking urges. **Methods:** We analyzed results from an observational study on changes in CO, smoking urges, and confidence in 650 unique adult daily smokers who received care from the DSCP with data reported from at least two visits. **Results:** Mean baseline Fagerström Test for Nicotine Dependence (FTND) score at the initial visit was 4.66 ($n=506$). Smoking abstinence rate (CO < 7 at last visit with initial CO ≥ 10) was 31.47% ($n=502$). DSCP patients demonstrated a mean reduction in CO of 8.77 parts per million (95% CI: 7.48-10.02, $p<0.001$) between the first and last visits ($n=569$). Urge rating, an aggregate of self-reported intensity and frequency of urges to smoke on scales from 1-7, decreased by a mean of 1.22 (95% CI: 1.00-1.43, $p<0.001$) between the first and last visit ($n=469$). Self-reported confidence and motivation increased by a mean of 0.96 points (95% CI: 0.72-1.20, $p<0.001$) on a scale of 1-7 between the first and last visit ($n=453$). **Conclusion:** The DSCP appears to demonstrate significant impacts on smoking abstinence, reduction, and urges, and an increase in confidence and motivation.

FUNDING: Federal

PS3-44

PRE-QUIT SMOKING REDUCTION PREDICTS POST-QUIT ABSTINENCE IN LIGHT SMOKERS

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Significance: Compared to non-smokers, light smokers (those who smoke ≤ 10 cigarettes per day) have a significantly increased risk of cardiovascular disease and cancer, and thus there is a need to develop effective treatments for light smokers. Unfortunately, most smoking cessation medications tested thus far (nicotine patch, nicotine gum, and bupropion) have been relatively ineffective for the treatment of light and intermittent smokers. One potentially promising treatment approach that may be worth consideration is the use of pre-quit medication in light and intermittent smokers. In heavier smokers, pre-quit medication use has led to pre-quit smoking reduction, which in turn has been associated with smoking abstinence. This has been seen with several medications, including nicotine patch, bupropion, and varenicline but has not been explored in light smokers. **Methods:** We are conducting a 16-week randomized controlled trial in which daily smokers (≥ 5 cigarettes per day) choose to take either varenicline or nicotine patch and are then randomized to receive either 4 weeks of pre-quit medication or pre-quit placebo prior to starting varenicline or nicotine patch. Here we report findings from a blinded secondary analysis of light daily smokers (5-10 cigarettes per day) on pre-quit smoking reduction and post-quit smoking abstinence. **Results:** A total of 24 light smokers were included in our analysis. One week after the target quit day, 28.57% of all light smokers were abstinent by self-report. Abstinent subjects showed mean pre-quit CO reduction of 11.25 ppm, whereas non-abstinent subjects showed mean pre-quit CO reduction of 2.95 ppm ($p = 0.02$). Subjects who reduced cigarettes during the pre-quit period by $\geq 50\%$ were categorized as responders. Responders showed a 12-week abstinence rate of 80%, whereas non-responders showed a 20% 12-week abstinence



rate ($p = 0.01$). **Conclusion:** The data appear to demonstrate a relationship between pre-quit smoking reduction and post-quit abstinence rates in light smokers. The study suggests that there may be a role for pre-quit medication treatment in light smokers.

FUNDING: Federal

PS3-45

PILOT RANDOMIZED CONTROLLED TRIAL OF WEB-DELIVERED ACCEPTANCE AND COMMITMENT THERAPY VERSUS SMOKEFREE.GOV FOR SMOKERS WITH BIPOLAR DISORDER

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Significance: Smokers with bipolar disorder (BD) have lower rates of successful quitting with standard cessation treatment. Our previous work showed promising acceptability and quit rates for a novel, targeted intervention for smokers with BD based on acceptance and commitment therapy (ACT). In this study, we developed and evaluated in a pilot RCT a web-based version of this program, designed for high reach. **Methods:** Treatment-seeking daily smokers ($n=51$) with DSM-IV diagnoses of bipolar I or II disorder were recruited from four sites across the US and randomly assigned to receive one of two web-based smoking cessation interventions—ACT-based WebQuit Plus ($n=25$) or standard-care Smokefree.gov ($n=26$). Participants received nicotine patch for 8 weeks. Key pilot trial outcomes were: (a) trial design feasibility (recruitment, retention), (b) intervention acceptability (satisfaction, server-logged website utilization), and (c) preliminary efficacy (estimated effect size using CO-confirmed 7-day point prevalence abstinence at end of treatment and 1-month follow-up). **Results:** We randomized 51 participants over 24 months. Retention was 73% at end of treatment and 80% at follow-up, with no significant differences by treatment arm (all $p > .05$). Compared to Smokefree, mean number of logins trended higher for WebQuit Plus (10.3 vs. 5.3, $p=.069$), as did overall satisfaction with the program (84% vs. 56%, $p=.066$). Usefulness of program skills was significantly higher for WebQuit Plus (75% vs. 29%, $p=.015$). Smoking abstinence at end of treatment was 12% in WebQuit Plus vs. 8% in Smokefree (OR=1.46, 95% CI=0.21-9.97). At follow-up, abstinence rates were 8% in both arms. **Conclusions:** Acceptability of WebQuit Plus relative to Smokefree was very promising. Estimated effect size of WebQuit Plus at end of treatment was a ~50% increase in the odds of quitting. Low abstinence rates overall and post-treatment decay of WebQuit Plus effects suggests that enhanced and extended treatment may be beneficial to support abstinence in smokers with BD. Recruitment for this trial was challenging, but retention rates were strong. Alternative recruitment methods may be necessary for a larger trial.

FUNDING: Federal

PS3-46

THE MODERATING ROLE OF SEX IN PAIN SEVERITY AND E-CIGARETTE HEALTH LITERACY

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SIGNIFICANCE: Although electronic cigarette (e-cigarette) use has increased among adults in the United States, there is still little knowledge of factors that may influence e-cigarette use or beliefs about use. Prior research suggests that health literacy plays an important role in e-cigarette beliefs, including perceived benefits and risks of e-cigarette use, as well as e-cigarette dependence. Yet, limited work has examined risk factors of poor e-cigarette health literacy. From a biopsychological perspective, sex and pain severity represent two constructs that may impact e-cigarette health literacy. To date, however, no research has investigated differences in e-cigarette health literacy across pain, sex, or their interrelation. **METHODS:** The present study was conducted to evaluate the main and interactive effect of pain severity and sex on e-cigarette health literacy. Participants included 319 e-cigarette users (60.5% female, $M_{age} = 36.82$ years, $SD = 10.62$). **RESULTS:** As hypothesized, a significant main effect emerged for pain severity ($b = -.06$, $p = .001$). Additionally, a significant pain by sex interaction suggested that pain uniquely related to poorer e-cigarette health literacy among women ($b = -.10$, $p < .001$), but not men ($b = -.01$, $p = .60$). **CONCLUSIONS:** This study is the first to our knowledge to investigate associations between pain severity, sex, and e-cigarette health literacy among adult e-cigarette users. The significant interaction was evident above and beyond the variance accounted for by the main effects as well as a range of covariates, including

age, income, education, dual combustible cigarette use, e-cigarette dependence, and perceived health status. The present findings suggest that women may constitute a group that is especially vulnerable to the effects of pain on e-cigarette health literacy.

PS3-47

SMOKING TREATMENT FOR ALL: PROACTIVE DELIVERY OF NICOTINE REPLACEMENT THERAPY TO FAMILIES OF HOSPITALIZED INFANTS IN A NEONATAL INTENSIVE CARE UNIT

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Significance: Neonatal intensive care unit (NICU) hospitalizations provide opportunities to engage families who smoke with evidence-based cessation treatments to protect infants from tobacco smoke exposure. The aim of this randomized controlled pilot study was to establish the feasibility and potential efficacy of providing motivational advice and free NRT (MA+NRT) to families of NICU infants. We hypothesized that providing MA+NRT or Quitline would be acceptable and feasible to NICU families and that higher use of the patch, quit attempts and smoking cessation would be demonstrated in the MA+NRT condition. **Methods:** RCT methodology allocated participants ($N=32$) from a large children's hospital to MA+NRT ($n=16$) or referral to a Quitline ($n=16$). Eligible participants had a NICU infant and reported ≥ 1 household smoker. All participants completed a baseline and two follow-up visits. MA+NRT participants received two weeks of 14- or 21-mg transdermal nicotine patches for every smoker in the home and two in-hospital motivational advice sessions. Quitline participants received information about tobacco smoke exposure and a referral to a Quitline. The primary outcome was accepting NRT patches (MA+NRT) and use of NRT (both groups). Bayesian analyses modeled NRT use as a function of treatment group. **Results:** Most participants were female ($n=31$; 96.9%) and identified as a racial/ethnic minority ($n=25$; 78.1%). Intervention attendance (100% session 1 [$n=16$]; 93.8% [$n=15$] session 2) and Quitline informational visit completion (100% [$n=16$]) were excellent; also, follow-up visit completion was high (30 out of 32; 93.8%). Most MA+NRT participants (81.3%; $n=13$) accepted the patches. No Quitline participants reported calling the Quitline, although some obtained patches. NRT use differed across groups, indicating a 0.91 posterior probability that a positive effect for MA+NRT exists (RR=2.32, 95% CI=[0.68-11.34]). **Conclusions:** This study demonstrated feasibility and acceptability for offering free NRT and motivational advice to NICU parents. A greater proportion of MA+NRT homes had at least one smoker use the patches, demonstrating the potential for engaging an underserved population of NICU families with evidence-based treatment. Future research will optimize intervention delivery and increase family engagement.

FUNDING: Federal

PS3-48

COMPARING HANDWASHING AND HAND SANITIZATION FOR NICOTINE REMOVAL IN A SAMPLE OF NEONATAL INTENSIVE CARE UNIT VISITORS: A RANDOMIZED CONTROLLED PILOT STUDY

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Significance: Prior work demonstrated that visitors of infants hospitalized in the neonatal intensive care unit (NICU) transport nicotine and other tobacco toxicants (collectively known as thirdhand smoke [THS]) on their hands. NICU infants' exposure to THS has also been documented, raising concerns for potential health risks (e.g., impaired wound healing and respiratory development). We conducted a randomized controlled pilot study comparing handwashing (HW; with soap) to ethyl alcohol-based hand sanitization (SAN) for nicotine removal from hands. We hypothesized that neither method would completely remove nicotine, but that HW would reduce nicotine found on skin to a greater extent. **Methods:** Non-staff NICU visitors were eligible if they reported current smoking, had an exhaled carbon-monoxide breath level of ≥ 7 parts-per-million, and spoke English. Consented participants were randomized to groups (HW [$n=7$] or SAN [$n=7$]), as well as to finger order for wiping (thumb, index, and middle). After randomization, the first finger was wiped and then participants washed or sanitized their hands. Research staff waited five minutes for all participants and then wiped the second finger. Approximately 40 to 60 minutes (after HW/S), which allowed nicotine to "sweat" back to the skin's surface, the third finger wipe sample was taken. Participants were advised not to smoke/vape



and avoid washing/sanitizing between finger wipes 2 and 3. Research staff re-sampled carbon monoxide breath levels and completed a brief interview on smoking behaviors with each participant between wipes 2 and 3. Bayesian generalized linear models compared log finger-nicotine levels across condition, accounting for fingers' surface area. One participant from each condition was removed from the analyses for the third wipe, due to protocol violations (e.g., smoking/washing between wipes 2 and 3). **Results:** Prior to HW/S, nicotine levels were similar in each group for finger 1 (**HW: Geometric Mean/GeoM**)=561.9 nanograms (ng) nicotine/finger; **SAN: GeoM**=468.5 ng). After HW/S, the SAN group demonstrated 118.0% (**HW: GeoM**=194.9 ng; **SAN: GeoM**=512.4 ng) and 258% (**HW:GeoM**=326.9 ng; **SAN: GeoM**=795.1 ng) higher finger-nicotine levels than the HW group for wipes 2 and 3, respectively, with posterior probabilities of 0.93 and 0.98. **Conclusions:** The HW intervention led to lower finger nicotine levels than SAN over time; however, neither HW nor SAN completely removed nicotine. Further research will determine best practices for keeping NICU infants protected from THS.

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PS3-49

THE IMPORTANCE OF INTERFERENCE BELIEFS: WHY DO SMOKERS WHO BELIEVE THEIR ANXIETY AND DEPRESSION WILL INTERFERE WITH THEIR ABILITY TO QUIT HAVE POOR CESSATION OUTCOMES?

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Background: Our prior work indicated that, among smokers who self-report depression or anxiety, those who believed their mental health would interfere with their ability to quit were substantially less likely to be abstinent at 12 months than those who did not hold that belief (13% vs 23%, $p=.001$). However, little is known about what factors contribute to this discrepancy. To understand the relationship between interference beliefs and cessation, we compared these groups on baseline characteristics known to predict cessation and treatment engagement variables and explored whether these factors explain differences in cessation. **Methods:** Participants were a subset of smokers enrolled in a RCT of two web-based smoking interventions who self-reported an anxiety or depression disorder ($n=942$). Participants were classified based on whether or not they reported believing their mental health condition would interfere with their ability to quit. Participant characteristics were assessed at baseline; automated website utilization data (e.g., logins) and other treatment variables (e.g., use of NRT) were assessed at 12-months post-randomization. **Results:** Relative to those who did not report interference beliefs, those who did were more likely to screen positive for depression, generalized anxiety, PTSD, and heavy drinking (FDR-adjusted p -values $<.01$). They also had lower baseline commitment to quitting and more smoking-specific experiential avoidance (p -values $<.01$). Those with interference beliefs logged in less to their assigned website ($p<.05$); no differences were found for other treatment engagement indices. Interference beliefs remained a significant predictor of cessation after controlling for stratification variables, commitment to quitting (potential confounder) ($p=.027$), as well as mental health symptom severity ($p=.01$). Logins had a small, but insignificant mediating effect on the relationship between interference beliefs and cessation (OR=0.98 [0.91, 1.00], $p>.05$). **Conclusion:** Interference beliefs may be a significant and unique risk-factor for poor cessation outcomes among smokers who self-report anxiety and/or depression. Targeting these beliefs in an intervention may lead to improved cessation rates.

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PS3-50

CHANGES IN DIURNAL CORTISOL AMONG PREGNANT WOMEN WHO ARE DAILY CIGARETTE SMOKERS

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Significance: Research shows women with higher average progesterone (PRO) across the menstrual cycle report greater perceived stress compared to women with lower PRO levels, suggesting a relationship between PRO and cortisol. The aim of this study is to explore the relationship between PRO and cortisol in pregnant smokers who have increasing levels of PRO. We hypothesized that cortisol patterns would differ between the second and third trimesters. **Methods:** Data for this analysis comes from a parent study in which pregnant women completed a testing period either during gestational weeks 12-22 or weeks 32-37. While ad libitum smoking, saliva cortisol samples were collected upon waking, 30 minutes post-waking, 2 hours post-waking, at 8:00pm and

before bed. Participants also completed surveys measuring subjective state (positive and negative affect, craving, physical symptoms and withdrawal) at the time of each cortisol sample collection. Linear mixed-effect models were fit to test whether there was a difference in the outcomes between the second and third trimesters. **Results:** Mean cortisol levels differed between trimesters ($n=50$ second; $n=45$ third) at two of five time points. At 8:00pm, the mean cortisol levels were 114% higher (95% confidence interval [CI]: 56-193% higher) in the third vs. second trimester ($p<.001$). At bedtime, the mean cortisol levels were 76% higher (95% CI: 30-138% higher) in the third vs. second trimester ($p<.001$). Although mean cortisol levels varied at two time points, subjective state measures did not vary significantly between the second and third trimesters at any of the measured time points. **Conclusion:** We found that cortisol levels in pregnant smokers varied by trimester later in the day. However, we found no evidence of a relationship between pregnancy trimester and subjective state in our sample. This suggests that there may be a relationship between PRO and stress that was not observed in self-reported subjective state measures of mood. This could be related to small sample size, other factors related to pregnancy or ad libitum smoking during cortisol sample collection. Further studies should be done on women during a period of smoking abstinence.

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PS3-51

A TRIAL OF TEXT (SMS) MESSAGING CESSATION SUPPORT AFTER HOSPITAL DISCHARGE

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Significance: Sustaining smoking cessation support after hospital discharge reduces the risks of relapse to smoking. However, face-to-face follow up is often expensive and time-consuming. We developed an automated SMS-based smoking cessation programme (ADEPT) for all smokers admitted to Emergency Departments in two general hospitals for delivery after discharge to provide motivational and distraction messages, medication (NRT) reminders and referral to other support services supporting discharged patients to quit smoking. We aimed to assess if ADEPT improved smoking cessation at 1 month compared to usual care (brief advice and behavioural support with NRT and referral to a community provider or outpatient clinic support). **Methods:** A two-arm parallel, randomized controlled trial, with 203 participants recruited from Emergency Departments in two hospitals in Auckland, New Zealand. Eligible participants were randomised at a 1:1 ratio to receive 4 weeks of ADEPT messages after inpatient usual care or usual care alone. The primary outcome was continuous smoking abstinence at one month. Exit interviews were conducted with 39 participants. **Results:** High quit rates were observed in both groups at 1 month. There was no difference between the intervention group (23.5%) and the control group (21.8%), relative risk (RR), 1.08 (95% CI, 0.65-1.80), $p = 0.76$). Exit interviews suggested ADEPT was well received. **Conclusion:** The programme was a feasible, effective, acceptable and sustainable method to encourage post-discharge patients to stay quit. Despite being no more effective, it offers a low-cost and convenient alternative to face-to-face services supporting discharged patients to quit smoking.

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PS3-52

BEHAVIOURAL INTERVENTIONS FOR SMOKING CESSATION - A SUITE OF COCHRANE REVIEWS INCLUDING AN OVERVIEW OF REVIEWS AND NETWORK META-ANALYSIS

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Significance: We set out to examine the effectiveness of behavioural interventions for smoking cessation and to investigate how modes of delivery, person delivering the intervention, and the components of these interventions impact effect. We also investigated whether effects vary by other characteristics, including population, intervention length, and provision of pharmacotherapy. **Methods:** We identified existing Cochrane reviews of behavioural treatments for smoking cessation, and updated these where needed. We followed standard Cochrane methods and pooled results in pairwise meta-analyses. GRADE was used to evaluate the certainty of the evidence. We screened the individual Cochrane reviews for randomized controlled trials with six months or longer follow-up that contained interventions and populations that would be considered 'jointly randomizable', and included these in a component network meta-analysis. **Results:** The overview of reviews covers 35 Cochrane reviews, 16 of which were updated as part of



this research. Certainty in the evidence ranges from very low (e.g. hypnotherapy) to high (e.g. incentives) according to GRADE criteria. Findings from individual reviews support the presence of variations in effectiveness, with considerable unexplained statistical heterogeneity in pairwise meta-analyses, and with some interventions showing clear effectiveness and others borderline to no effect. Updates led to significant changes in conclusions in some instances; for example, the evidence base for incentives was upgraded from low to high certainty; the evidence was found to no longer support the use of motivational interviewing for smoking cessation; and analyses were restructured in multiple reviews. Over 500 randomized controlled trials were eligible for inclusion in the network meta-analysis, contributing to analyses of comparative effectiveness which will also be presented. **Conclusion:** Findings highlight areas where more research is needed, as well as areas where the evidence base is stable and resources may be better focussed elsewhere. We will conclude on how the components of behavioural support improve abstinence.

FUNDING: Federal

PS3-53

SYNERGISTIC LEARNING: A GROUNDED THEORY STUDY OF TOBACCO SMOKERS LEARNING TO USE ELECTRONIC CIGARETTES

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Significance: Cigarette smokers are using Electronic Nicotine Delivery devices or electronic cigarettes (EC) to reduce or quit smoking. However, there is limited investigation into how smokers learn to use the EC in this meaningful way. Therefore, the aim of this study was to develop a theoretical understanding of smokers' experiences when learning to use an EC. **Methods:** Using Zoom video or phone services, semi structured basic interpretive interviews were performed with sixteen participants who had used an EC to reduce or quit cigarette use. Interviews were transcribed by the researcher and coded using the constant comparative method. NVIVO was used to organize the codes into themes for further analysis. **Results:** A substantive grounded theory evolved from data collection and analysis of the narratives. A model was formulated using four stages of synergistic learning involved when using an EC to reduce or quit smoking. Synergy, in this sense, incorporates the social interaction of a smoker learning about EC use combined with the exposure of material (vape shops, computers, etc.) and technical (EC and its components) aspects of the EC. This synergy provides for an informed experience that can create an intentional movement through the stages of learning about EC use. The four stages of the model are 1) CURIOUS-exploring the use of an EC, 2) IDENTIFY-experimenting with different types of EC, 3) WITNESS-advancing smoke free living by using an EC, and 4) EXPERT-becoming an EC advocate. **Conclusions:** This grounded theory begins to answer questions about how adult cigarette smokers learn to use an EC to quit or reduce smoking. It also leads to a pedagogy that can be considered when unlearning and relearning a new way of being. Healthcare providers are frequently involved in behavior change and this theory can guide their course of action when encouraging behavior change in their patients.

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PS3-54

EXPERIENCES OF EVERYDAY DISCRIMINATION IN RELATIONSHIP TO VAPING OUTCOMES AMONG COLLEGE STUDENTS

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Significance. Perceived discrimination and minority stress are risk factors for cigarette use. However, little is understood about the relationship between these experiences and electronic cigarette (e-cigarette) use among college students. **Methods.** College students completed an online survey about e-cigarette use ($N=488$; 73.2% female; 52.7% White, 30.5% Black/African American, 6.1% Asian, 5.3% other races, 3.9% multiracial). Participants reported how frequently they experienced everyday discrimination in nine situations [rated as *not at all*(0) to *almost every day*(5)] and identified which of their personal identities discrimination was directed toward. In additional analyses, students who identified as a sexual minority ($n=53$) identified up to 43 situations they experienced LGBTQ+ minority stress. Linear regression was used to examine whether discrimination and LGBTQ+ minority stress were related to vaping. **Results.** Of the entire sample, students reported that everyday discrimination was most commonly experienced due to race (19.7%), followed by physical appearance (18.4%), gender (17.6%), age (14.4%), weight (8.4%), education/income (6.6%), ancestry/national origin (5.0%), height (3.1%),

sexual orientation (2.6%), religion (2.4%), and physical disability (1.8%). Reporting more frequent experiences of discrimination was related to an increased likelihood of ever vaping ($OR=1.21$, $p=.027$) and vaping at least 100 times ($OR=1.24$, $p=.029$). Among e-cigarette current users, having more frequent discriminatory experiences was related to increased time spent vaping per day ($\beta=1.69$, $p=.047$). On average, LGBTQ+ individuals reported distress in 16 situations ($SD=11.0$); however, frequency of LGBTQ+ minority stress was not related to vaping outcomes. **Conclusions.** College students experienced discrimination based on a wide variety of identities. Among all students, more frequent everyday discrimination was associated with e-cigarette use. Given the commonly reported experiences of LGBTQ+ minority stress in this sample, future studies should examine minority stress and vaping in larger LGBTQ+ samples.

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PS3-55

A PILOT ECOLOGICAL MOMENTARY ASSESSMENT STUDY OF YOUNG ADULTS WHO USE BOTH E-CIGARETTES AND COMBUSTIBLE TOBACCO PRODUCTS

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Significance: The concurrent use of e-cigarettes (e-cigs) and combustible tobacco products is common in young adults. This ecological momentary assessment (EMA) study determined how young adults' ratings of subjective and contextual factors differ between episodes of using e-cigs only (EC), combustible tobacco products only (CT; cigs, cigars, cigarillos, hookah), and dual e-cig and combustible tobacco products (DU). **Methods:** Young adults ages 18-30 ($n=29$, 15 men/14 women, mean age 22.9, $SD=3.4$) who used e-cigs and 1+ combustible tobacco product at least once weekly completed a 1-week smartphone-based EMA. Participants completed random prompts twice/day assessing past-15-minute use of specific tobacco products, ratings of subjective factors (e.g., craving and withdrawal for each tobacco product used), negative affect (via the International Positive and Negative Affect Schedule Short Form) and contextual factors (e.g., socializing). **Results:** Participants reported low levels of cigarette dependence at baseline (median Fagerstrom Test of Nicotine Dependence (FTND) score 2, range 0-8). Over 1 week, they recorded 181 tobacco use episodes (40.3% EC, 47.5% CT, 12.2% DU). EC were more frequently reported by those with low (≤ 2) FTND scores (82.2% of EC; $p < 0.0001$) and CT by those with moderate/high (3+) FTND scores (86% of CT; $p < 0.0001$). Negative affect, craving and withdrawal scores did not significantly differ between tobacco use episode types. CT and DU were more likely than EC to occur in the presence of another smoker (52.3% and 59.1% vs. 13.7%; $p < 0.001$). EC were more likely than CT or DU to occur alone (61.6% vs. 30.2% and 31.8%; $p < 0.001$) and while working/studying (34.2% vs. 16.3% and 18.2%; $p=0.02$). **Conclusions:** Young adults with low FTND scores were more likely to report EC than CT episodes. EC episodes were most likely to occur alone and during activities such as working/studying. EMA data can inform tobacco regulators' understanding of dual e-cig and combustible tobacco product use behaviors.

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PS3-57

ASSOCIATION BETWEEN SELF-REPORTED AND BIOLOGICAL MEASURES OF NICOTINE INTAKE AMONG YOUNG ADULT NON-DAILY USERS

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Among current users of cigarettes and other nicotine products, non-daily use is common, particularly for young adults. However, few studies have evaluated the extent to which self-reported intermittent use is related to biological measures. The goal of the current study was to examine associations between self-reported frequency of nicotine use and hair nicotine among young adult non-daily smokers. We hypothesized that self-reported frequency of cigarette, e-cigarette, and hookah consumption would each be positively associated with hair nicotine levels. This study was a secondary analysis of data from a subsample of participants in a 3-year study of the course of tobacco use among young adults. Participants ($n=90$; 65% female; mean age = 20.7 at baseline) were mailed self-testing kits and questionnaires approximately one and two years into parent study participation. Participants reported an average of 7.3 cigarette days, 3.6 e-cigarette days, and 0.7 hookah days in the past 30. After accounting for self-reported exposure to secondhand smoking, sample order, and progress in the parent study, hair nicotine levels were higher for older, male participants ($ps<.03$). When all three products were entered into a mixed effects regression model, frequency of cigarette



and e-cigarette consumption were positively associated with nicotine levels ($p < .05$). When we compared assessments where participants did and did not report any cigarette use in the past 30 days, we found that e-cigarette frequency predicted hair nicotine levels among non-smokers ($p < .001$) but not among smokers ($p = .21$). Results support the use of self-reported measures of nicotine product consumption among young adults who use these products infrequently. These data also suggest that hair nicotine analysis can be used to detect weekly use of cigarettes, e-cigarettes, or both. This work was funded by NIDA R01 DA 037217

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PS3-58

PROACTIVE TOBACCO TREATMENT FOR VETERANS WITH POST-TRAUMATIC STRESS DISORDER

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Significance: Individuals with post-traumatic stress disorder (PTSD) smoke at higher rates compared to the general population and experience significant barriers to initiating cessation treatment. Proactive outreach addresses these barriers by directly engaging with smokers and facilitating access to treatment. This study evaluated the effect of proactive outreach on treatment utilization and abstinence among veteran smokers with and without PTSD.

Methods: This study is a secondary analysis of a randomized controlled trial, conducted from 2013-2017, that demonstrated the effectiveness of proactive outreach among veterans using VA mental health care services. Electronic medical record data were used to identify participants with ($n=355$) and without ($n=1583$) a diagnosis of PTSD. Logistic regressions examined the effect of proactive outreach on cessation treatment utilization (counseling, nicotine replacement therapy [NRT], and combination treatment) and abstinence (point prevalence and prolonged at 6- and 12-months) among those with and without PTSD.

Results: Compared to usual care, proactive outreach had a strong effect on the combined use of counseling and NRT among participants with (18.9% vs. 0.8%, OR=26.25, 95% CI: 3.43-201.17) and without PTSD (15.4% vs. 1.7%, OR=10.02, 95% CI: 5.11-19.64). There was also a strong effect for the intervention on 7-day point prevalence abstinence at 12-months among participants with (20.8% vs 8.9%, OR=2.62, 95% CI: 1.16-5.91) and without PTSD (18.9% vs 14.7%, OR=1.61, 95% CI: 1.11-2.34).

Conclusion: Proactive outreach increased treatment utilization and abstinence among smokers with PTSD. This population may need additional facilitation to initiate cessation treatment but are receptive to treatment when it is offered proactively.

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PS3-59

ALCOHOL OUTCOME EXPECTANCIES AS A FUNCTION OF SMOKING STATUS

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Co-use of alcohol and tobacco is common and associated with increased risk for negative health consequences, and recent research has focused on identifying cognitive mechanisms in the concurrent use of these substances. Smokers are more likely to evince problematic drinking patterns than nonsmokers, and positive alcohol outcome expectancies have been associated with increased alcohol consumption. Although stronger expectancies regarding the effects of alcohol may be one factor that motivates increased drinking among smokers, no prior work has examined alcohol expectancies as a function of smoking status. This study tested the hypothesis that current smokers would hold greater positive and lesser negative alcohol outcome expectancies than nonsmokers. Participants included 173 moderate-to-heavy drinkers (40% female, $M_{age} = 35$) who were either daily smokers ($n = 99$, $M_{CPD} = 9$) or nonsmokers ($n = 74$). The Alcohol Outcome Expectancies Scale (AOES) was used to assess positive (e.g., having a pleasant experience) and negative (e.g., feeling negative emotions) outcome expectancies. Results indicated that, after adjusting for sociodemographic and substance-related variables, smokers endorsed greater positive alcohol outcome expectancies than nonsmokers ($p < .01$). Examination of AOES subscales further revealed that smokers held greater expectations that drinking will be fun ($p < .01$), increase sexual arousal and experiences ($p < .05$), and reduce tension ($p < .01$). We observed no differences in negative alcohol outcome expectancies as a function of smoking status. This is the first study to demonstrate that positive alcohol outcome expectancies differ as a function of daily smoking status. Future research is needed to replicate and extend these findings to examine whether

smoking status moderates the association between positive alcohol expectancies and longitudinal drinking trajectories. Future work may also examine whether treatments targeting positive alcohol outcome expectancies can reduce co-use of nicotine and alcohol. This research was supported by Grant No. R01AA024844 awarded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA).

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PS3-60

A FORCED CHOICE PROCEDURE TO ASSESS THE RELATIVE REINFORCING EFFECTS OF NICOTINE DOSE PER SE

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Introduction: Assessing acute reinforcement due to specific nicotine doses could help determine what doses maintain dependence. We first describe the development and initial evaluation of a forced choice procedure adapted from preclinical and clinical research on other drug dependence to determine the relative reinforcing effects of nicotine per se in smokers. Then, new analyses of data on choice responses from prior laboratory-based studies are examined to further evaluate the procedure's validity. **Methods:** Using within-subject designs, two studies of overnight abstinent dependent smokers assessed choice between a higher vs. a very low (or no) nicotine option, administered via smoking (Study 1, $n=59$) and via nasal spray (Study 2, $n=42$). This research administered different nicotine doses in each product under blind conditions, initially to assess nicotine discrimination. Study 1 involved 5 higher nicotine content (doses) Spectrum cigarettes, 1.3-17 mg/g, one per session, each compared with 0.4 mg/g. Study 2 involved just 1 session, comparing 2.5 vs 0 $\mu\text{g}/\text{kg}$ nicotine per spray. In each study session, discrimination testing was followed by choice trials to assess preference for the higher vs lower nicotine option (total of 8 choices in Study 1, 24 choices in Study 2). **Results:** Both studies found that choice was significantly greater for the higher (vs lower) nicotine option, as hypothesized. In Study 1, choice was greater for cigarettes differing more widely in content from 0.4 mg/g (Wald $\chi^2(4) = 15.86$, $p < 0.005$, for interaction of higher content vs 0.4 mg/g comparison). Similarly, in Study 2, choice was greater for the nicotine vs. placebo spray, $F(1,39) = 10.43$, $p < .005$, as nicotine was preferred nearly twice as often as placebo. **Conclusions:** This forced choice procedure can efficiently determine the acute relative reinforcing value of a nicotine dose per se. Although more research with other dose comparisons and a larger, heterogeneous sample is needed, this method should aid determination of nicotine doses in cigarettes, and perhaps in other commercial products, that are or are not acutely reinforcing. Its use may help guide policy on regulating products to reduce their addictiveness.

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PS3-61

CHANGES IN ATTENTIONAL BIAS BEFORE AND AFTER A 4-WEEK TREATMENT OF VARENICLINE IN REGULAR CIGARETTE SMOKERS

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Introduction: Among regular cigarette smokers, attentional bias (AB) to smoking-related cues has been associated with increased smoking urges and greater probability of future relapse. We investigated whether smokers taking varenicline experience treatment-related changes in AB to smoking-related (SM) and social cues over time.

Methods: This is a within-subjects longitudinal design where participants receive a standard 12-week prescription to varenicline. Smoking status is verified at each study visit by expired carbon monoxide less than 3 ppm. AB is measured using a validated, free-viewing, eye-tracking system at 5 time points: baseline, 4-, 8-, 12-weeks and 6-months. Participants are presented a series of slides containing 4 images (1 SM, 1 neutral, 2 social). Primary outcome measure is the difference in the proportion of time spent viewing social and SM cues relative to neutral cues. Recruitment is ongoing (target $N=50$). **Results:** To date, 6 regular smokers (38.67 \pm 9.52 years old) have completed baseline and 4-weeks of treatment. Preliminary findings show a 59% increase ($t=-2.90$, $p=0.03$) in AB to social images from baseline to 4-weeks of treatment. Additionally, a decreasing trend was found, whereby AB to SM cues decreased 37% ($t=0.47$ $p=0.66$) from baseline ($\bar{x}:0.28\pm0.09$) to 4-weeks of treatment ($\bar{x}:0.23\pm0.08$). To date, 4 participants quit smoking at 4-weeks. Additional analyses will be presented comparing AB of quitters vs. non-quitters. **Conclusion:** Preliminary findings suggest significant increases in AB to social cues after 4-weeks of varenicline treatment. Furthermore, while results show



no significant differences in AB between SM cues, they do suggest a reduction in AB towards SM cues. Preliminary results support the hypothesis that ABs may be used as objective markers that reflect changes in smoking behavior (e.g., quitting and relapse). Future directions include the addition of non-smoking controls as a comparator group to better understand how varenicline affects AB among smokers undergoing treatment.

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PS3-62

CORRELATES OF JUUL USE AND SUSCEPTIBILITY TO USE JUUL AMONG COLLEGE STUDENTS

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Significance: Since its introduction into the marketplace in 2015, JUUL has become the most popular electronic nicotine delivery system among youth and young adults. Although there exists preliminary research into prevalence, correlates, and motives of JUUL use by young adults, continued efforts to identify factors that are associated with JUUL use and that might promote future JUUL use are warranted. The purpose of this exploratory study was to evaluate the extent to which demographics, beliefs, sources of information, and exposure to advertisements were associated with JUUL use and susceptibility to use JUUL. **Methods:** A diverse sample of 1001 undergraduate students from two public universities in California completed an electronic survey between February 2019 and May 2019. The sample was 64.6% female and 80.9% non-Caucasian race/ethnicity, and 45.5% endorsed an annual household income of less than \$50,000. Mean age of the sample was 20.2 ± 2.3 years, and 82.9% were within their first three years of undergraduate education. **Results:** Over 80% of participants reported awareness of JUUL, while 16.1% reported previous/lifetime JUUL use and 13.8% endorsed past-month/current JUUL use. Multinomial regressions indicated that, when never-use was the reference group, Caucasian participants were more likely to endorse past-month JUUL use than minority races/ethnicities (p 's ≤ .003). One-way ANOVAs showed that, when compared to never-use of JUUL, participants endorsing lifetime and current JUUL use more strongly agreed with statements that JUUL is safe to use, better for health than cigarettes, and an effective smoking cessation aid (omnibus p 's < .001, eta squared = .02 to .05). Hierarchical linear regressions suggested that, among never-users of JUUL, susceptibility to use JUUL was associated with believing JUUL is safe and being informed about JUUL by friends (p 's ≤ .04). **Conclusion:** Most young adults are familiar with JUUL products, and individuals who have used JUUL endorse beliefs that are not supported by systematic research. These data identify potentially useful targets for primary and secondary prevention efforts.

FUNDING: Unfunded

PS3-63

MACHINE LEARNING IDENTIFIES INTERACTIONS AMONG INTERVENTION COMPONENTS AND INDIVIDUAL DIFFERENCES IN MODELS OF ABSTINENCE 1 YEAR AFTER A TARGET QUIT DAY

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Background: The effects of smoking cessation intervention components may vary across individual differences and treatment contexts (co-occurring components). Analyzing moderation in factorial treatment designs can be challenging due to the number of potential interaction effects. **Objective:** We used machine learning to identify which intervention components and combinations work best for particular populations. **Method:** Data from 544 adult smokers in a 2 (8 vs. 26 weeks of combination nicotine patches and gum) x 2 (Maintenance counseling vs. none) x 2 (Adherence calls vs. none) x 2 (Feedback on electronically monitored gum use vs. none) x 2 (Adherence counseling vs. none) experiment were analyzed using *Generalized, Unbiased, Interaction Detection and Estimation* (GUIDE) classification tree modeling. Classification trees identified subgroups that differed maximally on self-reported 7-day point-prevalence abstinence 1 year post-quit, using individual differences assessed at baseline and randomly assigned intervention component main and interactive effects as predictors. **Results:** Abstinence at 1 year was related to intervention components and individual differences: i.e., baseline age, smoking heaviness, nicotine dependence, and negative affect. The combination of face-to-face adherence counseling and automated adherence calls predicted abstinence. Among those receiving only one of these interventions, extended

medication yielded particularly high abstinence rates, but only among those smoking no more than 22 cigarettes per day at baseline. Among those receiving both or neither adherence counseling and calls, maintenance counseling yielded high abstinence rates among those under age 55. Without maintenance counseling, nicotine dependence and negative affect were important predictors of smoking. **Conclusion:** Individual differences and smoking cessation intervention components interact in complex ways to predict long-term abstinence rates. Machine learning approaches along with factorial designs can help identify subgroups that may be particularly responsive to specific intervention components.

FUNDING: Federal

PS3-64

REDUCING SMOKING AMONG HIGH RISK YOUTH USING A MINDFULNESS MOBILE APP

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Significance: Smoking and substance use is very prevalent in adolescents in the juvenile justice system and there is a need for low cost efficacious interventions that can be deployed with this population. **Methods:** We developed a mobile app with funding via SBIR grant from NIDA and then conducted a pilot test with 60 high-risk adolescents referred from the juvenile justice system. Engagement and pre-/post- intervention outcomes of substance use were evaluated in the pilot study. The effects of the program on smoking and substance use between pretest and 8-week posttest were assessed using non-parametric Wilcoxon signed rank test and paired t-tests for non-continuous and continuous measures respectively. Daily measures of mood were also collected. **Results:** Participation rates were excellent (100% pretest and 95% at follow-up). Of the 60 study participants, 54 (90%) completed all four practice and training modules and 16 (27%) revisited at least one module after initially completing the modules with 4.1 modules on average revisited. Most of the participants (90%) also responded to daily mood rating prompts (average 13.2). Rates of any cigarette use in the past 7-days showed a significant decrease significantly from 21.7% at pretest to 12.3% at posttest ($Z = 2.00, p = .046$). Rates of marijuana use in the past month showed a significant decrease from 56.7% at pretest to 40.4% at posttest ($Z = 2.31, p = .021$). Rates of any vape pen or JUUL use in the past 7-days showed a non-significant decrease from 35.0% at pretest to 28.1% at posttest, ($Z = 0.63, p = .527$). Rates of alcohol use in the past month showed a slight, but non-significant increase. Lastly, reports of any use of tobacco, alcohol, and marijuana were computed in the past month and decreased over time from 68.3% at pretest to 57.9% at posttest, a trend-level decrease ($Z = 1.89, p = .059$). App engagement and satisfaction were significantly related to improved mindfulness and emotion regulation skills, as well as significantly related to decreases in alcohol, marijuana, and all substance use. **Conclusions:** Although the design did not include a control condition, significant pre/post changes in smoking and marijuana use are encouraging given the consistently high levels of use typically found among juvenile justice-involved youth. Improved mindfulness and emotion regulation skills suggests that the app is successfully targeting the intended mechanisms of change. A mindfulness app has potential for decreasing smoking in a population of high-risk juvenile justice adolescents that is difficult to engage in treatment.

FUNDING: Federal

PS3-65

THE EFFECTIVENESS OF INTEGRATING TOBACCO USE SCREENING AND CESSATION SERVICES IN A COMMUNITY BEHAVIORAL HEALTH SETTING

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Significance: Rates of tobacco use among individuals with mental illness (MI) are more than twice than that of the general population, making it a significant but undertreated problem. Tobacco-related illnesses are the leading cause of premature death among this population. We examined outcomes of a 12-month integrated health care program providing physical health screenings and tobacco cessation services (individual consultations, brief counseling, weekly classes) to adults receiving psychiatric care at an outpatient mental health clinic. **Methods:** Participants were drawn from a larger sample of patients (N=369) who completed a 12-month integrated medical and behavioral health program. We analyzed data for a subsample of 82 patients with current tobacco use at baseline (68% female; 77% Hispanic; 75% 45-64 years old). Tobacco use was assessed by self-report (past 30-day frequency; daily, weekly, once or twice, never) and breath carbon monoxide (CO). **Results:** Of the 82 tobacco users at baseline, most users



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(n=70; 85%) reported daily tobacco use. A majority (89%) of users expressed interest in tobacco cessation services. Per self-report, 26 baseline smokers (32%) reduced their tobacco use frequency by the 12-month timepoint. Of those, 16 (20%) quit by 12-months (i.e., self-report of no tobacco use in past 30 days). We grouped users who reduced their smoking (n=26) and users who did not reduce their smoking over the 12-month period (n=56). Then we compared the 12-month CO levels between these groups. Mean breath CO at 12-months for patients who reduced or quit smoking (M=6.60, SD=6.47) approached levels indicative of abstinence from smoking (CO<6ppm), and was significantly lower than that of other program completers [M=13.20, SD=8.67; t(80)=3.40, p<0.01]. **Conclusions:** Our findings support that screening and tobacco cessation treatment integrated into behavioral health service programs are critically needed and effective. Contrary to common belief, our results reveal that tobacco users with MI are motivated to quit smoking and are more successful when tobacco cessation services are more easily available ("open access") and integrated into behavioral health programs.

FUNDING: Federal

PS3-66

PHYSIOLOGICAL AND SUBJECTIVE EFFECTS OF PROTONATED NICOTINE LIQUIDS IN ELECTRONIC CIGARETTE USERS AND CIGARETTE SMOKERS

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Significance: Electronic cigarettes (ECIGs) produce an aerosol by heating a liquid that often contains nicotine. The liquid nicotine is sometimes protonated (salt), potentially making the aerosol easier to inhale than if it were freebase. This study's purpose is to determine, in ECIG users and cigarette smokers, the effects of three concentrations of protonated nicotine aerosolized at two different power settings (in watts). **Methods:** Eleven participants (six men, seven white; four cigarette smokers, seven regular ECIG users) with a mean (SD) age of 29.9 (12.4) years attended six sessions that varied by liquid nicotine concentration (10, 15, or 30 mg/ml protonated nicotine) and device power (15 or 30 W). Participants took 10 puffs from each product. Heart rate (HR), subjective effects and puff topography were measured and blood sampled (topography and plasma nicotine data not yet available). **Results:** Preliminary analysis revealed a pattern of increased HR as protonated nicotine concentration and device power increased, suggesting that plasma nicotine concentration may also be increasing similarly. A significant interaction of device power and time ($p < .05$), as well as main effects of time and device power were observed ($ps < .05$), with significantly increased HR across all conditions after product use. The largest HR increases occurred in the higher powered conditions. For example, there was a significant difference between the mean HR increase of 8.9 (5.68) bpm in the 10 mg/ml+15 W condition and 16.9 (10.23) bpm in the 30 mg/ml+30 W condition. For the subjective items "craving" and "urge to smoke", main effects of time were observed ($ps < .01$). Ratings for both items decreased in all conditions following product use, with 30 mg/ml+30 W producing the lowest craving and urge scores. **Conclusions:** The physiological and subjective effects of acute protonated nicotine product use is largely unknown. These results suggest that protonated nicotine delivery is likely influenced by the concentration of nicotine and the power of the device. Research evaluating the effects of protonated nicotine products under a variety of conditions can inform future product regulations as these products continue to grow in popularity.

FUNDING: Federal

PS3-67

FOSTER YOUTHS' REACTIONS TO A TECHNOLOGY-BASED SMOKING CESSATION INTERVENTION

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While nearly one-third of youth in foster care smoke daily, little attention has been paid to screening and intervention for this population. Accessible and engaging interventions must be created that decrease this health disparity. Study aims were to test feasibility and acceptability of a computer- and mobile phone-based smoking cessation intervention (iHeLP) among weekly cigarette smokers exiting foster care (ages 18 to 20). Within a two-arm trial, we conducted exit interviews in which participants reflected on their experience with the intervention (n = 18) or control (n = 17) condition. Topics included how participants felt the program worked/did not work, suggested changes, and perceived

barriers to quitting. Two authors independently coded transcripts; coding was iterative, leading to a final list of codes applied to remaining transcripts and re-review of previous transcripts. iHeLP participants consistently stated that the program prompted them to reflect on their smoking, often helping identify triggers. The majority commented on the simplicity of iHeLP, which helped keep them engaged. For some, the messages became an integral aspect of their daily routine, and nearly all desired iHeLP to last longer than 6 months. Popular recommendations included adding a monthly time in which they could ask a professional questions via chat room, a cessation counselor, smoking-related videos, and peer support specialists. Control group participants, who received generic, untailored motivational messages, also felt our modality was easy to use. Suggestions for changes included help identifying smoking triggers, weekly tracking of cigarette use, advice for quitting, and feedback on changes to smoking behavior, validating the content in the iHeLP arm. Only two participants had used or considered using e-cigarettes as an alternative to combustible cigarette smoking. Coverage for smoking cessation under the Affordable Care Act and through Medicaid, and trends toward FDA approval of technology-based interventions, offer promising opportunities to impact cessation rates among this population.

FUNDING: Federal

PS3-69

NEGOTIATING HEALTH, A QUALITATIVE ANALYSIS OF HOME SMOKING RULES AMONG FAMILIES WITH MEDICALLY VULNERABLE INFANTS

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Significance: Approximately 5000 child deaths are attributed to secondhand smoke exposure (SHSe) annually which is three times the number of childhood cancers combined. Low birth weight infants discharged from a neonatal intensive care unit (NICU) are especially vulnerable to the effects of SHSe (e.g., respiratory infections, SIDS). Implementation and maintenance of home and/or car smoking bans could mitigate these risks; however implementation of bans is challenging for many families. Guided by the Behavioral Ecological Model, we explored familial and sociocultural factors which exert influence on decision making and implementation about smoking rules. **Methods:** Qualitative interviews were conducted with 20 mothers of infants discharged from a large children's hospital NICU (n=1200 admission/year), who reported at least one smoker living in the home. The sample was drawn from mothers participating in the Baby's Breath II study [CT: NCT01726062] which tested a behavioral intervention on SHSe. An in-depth interview guide was used to explore four domains related to smoking: (1) family life, structure and relationships; (2) cultural influences; (3) social networks; and (4) smoking history. Questions were open-ended, supplemented by probing questions to elicit a richer set of responses for each topic. Data were analyzed using a thematic analysis approach and key themes and subthemes were identified. **Results:** Participants identified three main themes that influenced their ability to implement and maintain smoking bans: 1) household structure (living with parents vs. with a partner); 2) power dynamics, gender norms and hierarchical authority (powerlessness in relationships influenced ability to advocate about SHSe); 3) burden of sole responsibility (conflicts about smoking and lack of support hindered ability to maintain rules). Sub-themes of familial cohesiveness and relationship strength emerged as contributors to each theme. **Conclusions:** Findings from this qualitative study support the Behavioral Ecological Model. Further, we identified specific gender norms, and partner as well as familial dynamics that impede or bolster a new mother's ability to implement and maintain a home and/or car smoking ban. Tailoring interventions to help individuals navigate these complex relational processes (e.g., having difficult conversations non-confrontationally, raising confidence, and seeking allies) may be especially important for effective SHSe interventions.

FUNDING: Federal

PS3-70

SHORT-TERM ABSTINENCE EFFECTS IN NEVER-SMOKING, EXPERIENCED ELECTRONIC CIGARETTE USERS

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Significance: Electronic cigarettes (ECIGs) are capable of delivering doses of nicotine that are known to maintain dependence via cigarette smoking. Relative to cigarettes,



little work has addressed withdrawal effects upon ECIG cessation. Work that does exist is largely confounded by ECIG users' history of cigarette smoking. This study examined the effects of short-term ECIG abstinence in experienced ECIG users who reported minimal history of cigarette smoking. **Methods:** Nine participants ($M_{age} = 20.8$, 67% female, 67% white) completed two within-subject, randomly ordered conditions that differed by duration of abstinence: 0 (*ad lib*) or 3 h (abstinent). Participants used their own ECIG device and liquid for the *ad lib* condition. Each session began with a 10-puff directed ECIG bout to standardize time since last use, followed by regularly scheduled subjective and cognitive batteries. Heart rate was recorded throughout sessions and puff topography was measured for ECIG use during the *ad lib* condition. **Results:** Participant characteristics included: average ECIG use duration of 1.9 years ($SD = 1.7$); average Penn State ECIG Dependence Index score of 12.1 ($SD = 3.3$); 78% preferred pod-style ECIG devices; 100% met DSM-V criteria for tobacco dependence; and average lifetime number of cigarettes of 20.3 ($SD = 31.8$). Ratings were higher for withdrawal-related items (urges to vape, Factor 2), and lower for nicotine-related items (lightheaded, headache), during abstinence relative to *ad lib* use ($F_s > 2.4$, $p_s < .05$). Also relative to *ad lib* use, abstinence resulted in poorer inhibitory control ($F = 7.4$, $p = .03$) and decreased heart rate ($F = 5.3$, $p = .05$). When using their ECIG *ad lib*, participants ($n=7$) took an average of 53.6 puffs ($SD = 21.6$, Range = 17 to 77), with average puff durations of 3.15 s ($SD = 1.12$; Median = 3.48) and inter-puff intervals of 254.7 s ($SD = 162.1$; Median = 184.7). **Conclusion:** Preliminary findings suggest the presence of abstinence-induced withdrawal effects within a few hours of ECIG cessation. Future work requires larger sample sizes, longer observation periods, and placebo ECIG controls.

FUNDING: Federal; Academic Institution

PS3-71

ABUSE LIABILITY OF JUUL ELECTRONIC CIGARETTES IN TOBACCO NAIVE YOUNG ADULTS

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Significance: A primary concern with use of electronic cigarettes (ECIGs) is uptake by youth and young adults who are largely naive to tobacco. Such behavior is likely influenced by appealing flavors that may mask aversive sensory characteristics and/or reinforce nicotine effects, as well as nicotine salts in some products that may be easier to inhale. This study seeks to examine the abuse liability of flavored JUUL ECIGs in 18-24 year olds with little nicotine/tobacco experience (<100 lifetime tobacco uses; ECIG use > 3 lifetime but < 7 days of consecutive use). **Methods:** Twenty-two young adults ($M_{age} = 19.6$ years; 77.3% Caucasian; 63.6% female) experienced two double-blind, within-subject conditions: fruit/mango or tobacco JUUL (5% nicotine). Each condition included two 10-puff bouts, and measures of subjective ratings, behavior, choice, heart rate, and puff topography. Exit interviews assessed ECIG risks, expectancies, and flavor discrimination. Analyses included lifetime ECIG use as a covariate (Range = 3-50 uses; $M = 10.27$, $SD = 10.14$, $Mode = 10$). **Results:** Higher ratings of taste good and several nicotine-related effects (e.g., dizzy, lightheaded) were observed for fruit relative to tobacco flavor ($F_s > 6.49$; $p_s < .05$). Also observed were pre-post increases for most subjective ratings (e.g., pleasant, dizzy), as well as heart rate ($F_s > 4.66$; $p_s < .05$). No difference between flavors was observed for average puff duration ($F = 0.5$, $p > .05$), or for the number of puffs earned on a progressive ratio task or the probability of purchase at zero dollars ($t_s < 1.89$, $p_s > .05$). Negative expectancies were significantly higher than positive expectancies ($t(21) = -6.3$, $p < .01$). 67% of participants accurately discriminated flavors. **Conclusions:** The pattern of results for subjective and heart rate data indicate exposure to nicotine, but few significant differences between flavors were observed. Participants' expectations of ECIG use, which were primarily negative, may have influenced results. Future work requires a larger sample with a wider range of lifetime ECIG uses.

FUNDING: Academic Institution

PS3-72

COSTS OF IMPLEMENTING TOBACCO TREATMENT PROGRAMS IN NCI'S CANCER CENTER CESSATION INITIATIVE (C3I)

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Background: The NCI Cancer Center Cessation Initiative (C3I) was launched in 2017 to provide financial and programmatic assistance to develop tobacco treatment programs (TTPs) for oncology patients in 42 selected NCI-designated cancer centers. Participating centers were charged with implementing unique evidence-based TTPs that fit their institutional resources and needs. **Methods:** C3I-funded cancer centers retrospectively evaluated TTP implementation costs with technical assistance from the initiative's Coordinating Center. We analyzed operating costs at seven participating centers during the first 6 months of implementation. Personnel salary costs were estimated based on Bureau of Labor Statistics wage data adjusted for area and occupation, and adding 30% for benefits. **Results:** The TTPs varied considerably in terms of TTP components including staffing levels, technology, and the provision of medications, education and/or training materials. Total operating costs across funded centers varied from \$517 to \$21,471 per month. The largest operating cost category was personnel (\$5,731 to \$19,887), with the highest costs in that category attributable to the provision of in-person TTP services. No personnel costs were reported for one TTP that adopted a point-of-care model. Monthly costs ranges for other categories were: materials (\$17-\$424), training (\$350-\$511), technology (\$250-\$867), and equipment (\$117-\$1,325). Cost-per-participant ranged from \$3 in a point-of-care program to \$460 in a TTP that offered in-person counseling. Total cost-per-quit across the seven Centers ranged from \$155 to \$2,222. **Conclusion:** C3I centers have implemented a wide range of TTP services, including referral to the quitline, in-person and/or telephone-based counseling, integrated voice response systems, web- and text-based services, and medications. While early in the initiative, the cost-per-quit was relatively modest relative to other prevention interventions. Evaluating implementation and programmatic costs of TTPs provides decision makers in cancer care settings with the important additional information needed to optimize resource allocation when establishing tobacco treatment services.

FUNDING: Federal

PS3-73

PRIMARY CARE CLINICIANS' PERCEIVED CHALLENGES TO SCREENING AND COUNSELING ADOLESCENTS ABOUT E-CIGS AND OTHER SUBSTANCES

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Significance: The landscape of adolescent substance use has changed, with youth most likely to use electronic cigarettes (e-cigarettes), hookah and marijuana. The objective of this study was to examine adolescent health care clinicians' screening practices as well as knowledge, attitudes, comfort level, self-efficacy, and challenges with screening and counseling adolescents across a range of tobacco products. **Methods:** Cross-sectional online survey of adolescent health care clinicians (family physicians, pediatricians, and other health professionals) from 10 US medical schools and respondents to national surveys administered by the American Medical Association (AMA), the American Academy of Family Physicians, and American Academy of Pediatrics (AAP) research networks. Clinicians were queried clinicians' knowledge, attitudes, comfort level, self-efficacy, and challenges with screening and counseling adolescent patients (10-17 year olds) about marijuana, blunts, cigarettes, e-cigarettes, hookah, and alcohol. **Results:** 833 clinicians completed the survey. 84% of respondents reported screening for cigarette use, 50% for e-cigarette use, 23% for hookah use, 75% for marijuana use, and 79% for alcohol use. Clinicians estimated that 16% of all 10-17 year old patients used cigarettes, 12% used e-cigarettes, 8% used hookah, 21% used marijuana, 9% used blunts, and 32% drank alcohol; yet they estimated that 11% of their 10-17 year old patients used cigarettes, 7% used e-cigarettes, 4% used hookah, 18% used marijuana, 8% used blunts, and 24% used alcohol. The majority (80%) of clinicians reported feeling very



comfortable discussing cigarettes and alcohol use with their patients, while 66% felt comfortable talking about marijuana, 50% felt comfortable discussing e-cigarettes, and 40% felt comfortable discussing blunts and hookah. Clinicians felt most comfortable discussing the health impact of cigarette smoking and alcohol use (88% and 83%, respectively) and felt least comfortable discussing the health impact of hookah (34%). **Conclusions:** Overall, this study identified a gap between products most commonly used by adolescents and the products for which clinicians most consistently screen and counsel adolescents.

FUNDING: Unfunded; Academic Institution

PS3-74

A GUIDED IMAGERY SMOKING CESSATION INTERVENTION DELIVERED USING A TELEPHONE QUITLINE MODEL—RESULTS OF A RANDOMIZED FEASIBILITY TRIAL

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Significance: Guided imagery (GI) uses enhanced visualization to achieve desired goals and outcomes, and evidence supports its use for smoking cessation. Little research has focused on how GI can be delivered to smokers using remote or virtual methods. Telephone-based tobacco cessation quitlines are a standard of care for tobacco cessation. The present study was designed to test the feasibility and potential impact of a GI tobacco cessation intervention delivered using a quitline model. **Methods:** The feasibility trial was conducted between 05/02/18 - 12/31/18. 105 participants were recruited through the statewide quitline or community-based methods and randomized to a GI Intervention Condition (IC; n=56) or active behavioral Control Condition (CC; n=49). We used a 6-session protocol over 6 weeks for each condition focusing on: benefits of quitting; triggers for smoking; alternative strategies; coping with cravings and withdrawal; staying quit; and 4 weeks of NRT. The IC focused on creating and using GI audio files to visualize behavior change while CC practiced behavioral techniques. Tobacco use, GI use, and attitudes towards quitting and GI were assessed at baseline, 8-weeks and 6-months post-enrollment. **Results:** Participants were primarily female, non-married, non-Hispanic white, with >high school education and a mean age of 50.5. Participants smoked a mean of 15.8 cigarettes/day and 20.0% also used e-cigarettes. Retention at 6 months was 81.9%. The mean number of sessions was 4.8, with 66.7% attending all 6 sessions; 82.9% used NRT. At 6 months, 7-day self-reported cessation was 34.1% in IC and 50.0% in CC (OR=0.52, 95% CI: 0.22, 1.23). The 30-day cessation pattern was similar (IC=27.9% vs. CC=38.1%; OR=0.63, 95% CI: 0.25, 1.57). Participants in both arms were highly satisfied with the program (median scores of 5/5). **Conclusion:** Both the IC and CC protocols were feasible to deliver. We surpassed our recruitment goals and had high levels of adherence and retention. Both conditions had quit rates comparable to those of quitlines and received high consumer satisfaction ratings. The next step is to conduct a fully-powered, randomized trial to establish efficacy.

FUNDING: Federal

PS3-75

HOW DO REASONS FOR FIRST TRYING E-CIGARETTES RELATE TO LEVELS OF CONTINUED USE AMONG COLLEGE STUDENTS?

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Despite research showing there are many reasons young adults try e-cigarettes, less is understood about how these motives are related to levels of continued use (i.e., currently vaping and/or experienced vaping) beyond experimentation. College students (N=488) completed an online survey about their use of e-cigarettes. Ever vapers (n=282) endorsed up to 15 reasons for trying e-cigarettes. Students were classified on two dimensions: current users (vaped within the past 30 days) and experienced users (vaped at least 100 times). We report the prevalence of endorsed reasons and examined associated between reasons for trying e-cigarettes and likelihood of current vaping and vaping at least 100 times. Analyses corrected for Bonferroni ($p < .003$). The 10 most common reasons for ever trying e-cigarettes were: *curiosity*(91%), *friends were using them*(86%), *appealing flavors* (71%), *easy access*(61%), *doesn't smell bad* (54%), *peers/coworkers were using them* (46%), *you can use anywhere* (40%), *they are a healthier/ safer alternative to smoking cigarettes*(38%), *you can hide it from others* (37%), and *significant other was using them* (36%). Notably, only 13% of students tried vaping to quit smoking. Likelihood of current vaping was significantly related to the following reasons: *peers/coworkers using them*, *significant other using them*, *easy to access*, *can use it anywhere*, *doesn't smell bad*, *can hide it from others*, *healthier/*

safer alternative to cigarettes, and *to help quit smoking*. Likelihood of vaping at least 100 times was significantly related to: *appealing flavors*, *peers/coworkers using them*, *easy to access*, *can use it anywhere*, *doesn't smell bad*, *can hide it from others*, *healthier/ safer alternative to cigarettes*, *to help quit smoking*. Although college students tried e-cigarettes for many reasons, particularly because of curiosity, only some of these reasons were associated with being a current or experienced vaper. Importantly, appealing flavors was a common reason (71%) to try e-cigarettes and associated with longer term vaping. Social influences, convenience of use, and cigarette cessation were also motives related to longer continued use after initiation.

PS3-76

DELAY DISCOUNTING RATES IN SMOKERS WITH AND WITHOUT HIV

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Significance: People living with HIV (PLWH) smoke cigarettes at higher rates than the general population with traditional cessation methods being less effective, putting PLWH at greater risk for negative health outcomes. Therefore, it is critical to identify the factors that underlie this health disparity. Delay Discounting is the ability to put off a smaller, immediate reward for a greater, future one and plays an important role in predicting smoking cessation success. **Objectives:** This study aimed to: 1) compare Delay Discounting between adult smokers with (HIV+) and without HIV (HIV-); 2) evaluate whether smoking abstinence disproportionately increases Delay Discounting among smokers with HIV; and 3) assess if Delay Discounting would be predictive of post-treatment cessation outcomes. **Methods:** This sub-study was part of a larger study examining withdrawal-related cognitive measures of HIV+ smokers and HIV- smokers at two counter-balanced laboratory sessions (once smoking-as-usual and once following 24 hours biochemically confirmed abstinence) then again, after 8 weeks of smoking cessation treatment. The current study utilized both between-subjects (HIV+ N=34; HIV- N=46) and within-subjects designs (abstinence condition) to measure delay discounting. **Results:** We did not find any significant difference in delayed discounting rates between HIV status groups ($p=0.49$), within-subject abstinence effects ($p=0.70$), or in post-treatment cessation ability ($p=0.20$). However, the HIV- group exhibited an increase in Delay Discounting following smoking cessation treatment compared to baseline ($p=0.02$), whereas the HIV+ showed no change ($p=0.09$). **Conclusions:** These findings suggest that delay discounting is relatively stable among HIV+ smokers and may be more critical to predicting smoking cessation success among HIV- smokers. Future studies should examine Delay Discounting performance against non-smoking HIV- controls.

FUNDING: Federal; Academic Institution

PS3-77

EFFECT OF A SIMULATED BAN OF MENTHOL IN CIGARETTES OR E-CIGARETTES ON SMOKING BEHAVIOR

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Significance: With the Food and Drug Administration considering regulating menthol flavoring in tobacco products, it is important to determine if any regulatory restrictions for menthol flavoring should be enacted consistently across tobacco products or if cigarettes should be treated differently than other products such as e-cigarettes. **Methods:** In this analysis, 26 African American smokers of menthol cigarettes completed a study in which they were asked to abstain (n=14) or not abstain from smoking menthol cigarettes (n=12) for an 8 week period. Those asked to abstain from menthol cigarettes could smoke non-menthol cigarettes if they chose to. Using a within subject design, participants in each group received one month of menthol flavored e-cigarettes and one month of tobacco flavored e-cigarettes in random order. Number of cigarettes smoked during each month was compared as was exhaled CO concentrations at the end of each month. **Results:** Larger decreases in amount smoked ($p=0.05$) and exhaled CO ($p=0.03$) were reported by those randomized to abstain from menthol cigarettes with similar effects observed regardless of e-cigarette flavor provided. Those asked to abstain from menthol cigarettes, smoked at baseline an average (SD) of 9.5 (5.7) cigs / day. When provided menthol flavored e-cigarettes, smoking decreased to 2.0 (4.1) cigs/day and when provided tobacco flavored e-cigs to 1.8 (4.4) cigs /day. Exhaled CO was 16.6 (6.2) at baseline, 12.1 (8.0) after 1 month of menthol e-cigs and 10.3 (7.3) after 1 month of tobacco flavored e-cigs. Those not asked to abstain from menthol cigarettes, smoked 13.0 (9.2) cigs/day at baseline. When provided menthol flavored e-cigarettes, they smoked 7.7 (4.4) cigs/day and when provided tobacco flavored e-cigs smoked 7.9 (4.3) cigs /day. Exhaled CO was 10.2 (3.9) at baseline, 10.2 (4.1) after 1 month of menthol e-cigs and 10.6 (5.5) after 1 month of tobacco flavored e-cigs.



Conclusions: A simulated ban on menthol cigarettes, when e-cigarettes are available, has the potential to reduce smoking. For the brand of e-cigarettes provided (i.e., Vuse), the flavor of e-cigarettes provided did not affect amount smoked.

FUNDING: Federal; Nonprofit grant funding entity

PS3-79

INVESTIGATING THE INFLUENCE OF NICOTINE DOSE AND DOSE EXPECTANCY IN LAPSE TO RELAPSE PROGRESSION

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Most individuals who lapse after trying to quit smoking return to smoking. An experimentally induced lapse following a "quit attempt" increases the risk of subsequent smoking (Shadel et al., 2011), suggesting a causal influence, and the presence or absence of nicotine appears to make no difference (Juliano et al., 2006). Non-pharmacological factors appear to play a role in the detrimental effects of a smoking lapse and warrant further exploration. Using a 10-day lab analogue of smoking cessation, this study tested the effects of nicotine dose and dose expectancy on lapse-to-relapse progression. Four-day abstinent smokers (N = 199, mean age = 40 years, 40% female, 74% African-American, 78% menthol, mean 14 cigarettes per day) were randomized to one of four conditions of the 2 (GIVEN NICOTINE vs. GIVEN PLACEBO) × 2 (TOLD NICOTINE vs. TOLD PLACEBO) Balanced Placebo Design (smoked 2 experimental cigarettes), or a no-lapse control. Afterwards, participants were incentivized to abstain for 6 days and smoking was tracked and biochemically verified. Nicotine cigarettes produced greater heart rate boost and subjective effects (e.g., reward, craving reduction, aversion) than placebo cigarettes but there was no difference in CO boost. The effects of the BPD manipulation were observed in the first 24 hours. Cox regression revealed that those GIVEN NICOTINE had greater smoking risk than those GIVEN PLACEBO ($Wald = 4.80$, $HR = 2.66$, 95% CI = 1.11- 6.36). Those TOLD NICOTINE had greater smoking risk than those TOLD PLACEBO ($Wald = 2.18$, $HR = 1.85$, CI = .82 - 4.82). Dose and dose expectancy did not interact. Some individual difference variables (e.g., menthol status, abstinence confidence, alcohol consumption), but not dependence or gender, also predicted greater "relapse" risk. These findings suggest that both nicotine and expectancy play a role in lapse-to-relapse progression. However, limitations due to the non-treatment seeking sample, experimental cigarettes, and experimental setting need to be considered. Further research investigating lapse-to-relapse mechanisms may aid the development of lapse-responsive interventions and increase overall rates of smoking cessation.

FUNDING: Federal

PS3-80

USE OF TOBACCO PRODUCTS BEFORE AND AFTER USE OF E-CIGARETTES IN A CONVENIENCE SAMPLE OF ADULT NEVER-SMOKER, CURRENT DAILY E-CIGARETTE USERS: A SEMI-STRUCTURED INTERVIEW PILOT STUDY

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Introduction: E-cigarette (EC) use in never smokers is increasing. One concern about increased EC use in this group is that it may lead to use of combustible tobacco products. Studies on the use of ECs and other nicotine products have surveyed at six-month intervals and thus may have missed transitions within shorter intervals. This pilot study provided a more fine-grained analysis of the order of use of other tobacco products relative to ECs in a sample of never-smokers. **Methods:** Semi-structured interviews were conducted in (n=19) adult never-smoker (i.e., <100 lifetime cigarettes), current daily EC users. Participants were part of a larger clinical trial assessing nicotine withdrawal from e-cigarettes (NCT02825459). That trial excluded individuals with current (i.e., greater than 5 times past month) use of a nicotine product other than ECs. Participants answered questions about the month and year of initiation of ECs and other tobacco products. **Results:** The mean age of the sample was 21.9 (SD=4.3) years; 42% were female. The mean age of onset of vaping was 19 years. 3/19 (16%) of the sample reported that ECs were the only product ever used, 5/19 (26%) reported using tobacco products after EC use, 2/19 (11%) reported concurrent (i.e., within the same month) start with a tobacco product, and 9/19 (47%) reported use of a tobacco product prior to ECs. In this latter group, the initiation of use of a tobacco product occurred a median of 19 months prior to ECs. The most common earlier product was hookah (7/9). For those using tobacco

products after ECs (5/19), this occurred a median of 15 months after EC use. The most common subsequent products were TCs (4/5) and cigars/cigarillos (4/5). **Conclusion:** Half of this convenience sample of adult never smoker EC users had tried a tobacco product prior to use of ECs; fewer initiated use of a tobacco product after EC use. Given the small convenience sample size, retrospective reporting and absence of a comparison group of non-EC users, longitudinal research with frequent assessments is needed to better understand the role of ECs in leading to use of combustible tobacco products.

FUNDING: Federal

PS3-81

SYSTEMS-BASED INTERVENTIONS TO IMPROVE TOBACCO TREATMENT FOR ONCOLOGY PATIENTS

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Significance: Tobacco use cessation increases cancer treatment effectiveness and survival rates as well as reducing surgical complications, side effects, cancer recurrence, and death from other disorders. Nonetheless, effective tobacco treatment is not systematically provided to most oncology patients. At Roswell Park, tobacco treatment was hindered by a failure to identify tobacco users, limitations on the treatment provided by the quitline, and a lack of treatment options that met the NCCN Clinical Practice Guidelines. As a part of the NCI Moonshot Cancer Center Cessation Initiative, Roswell Park sought to improve the systematic identification and treatment of its tobacco-using oncology patients. **Methods:** A brief, mandatory, 4-item tobacco screening assessment was developed in the EMR which included cigarettes, cigars, hookah, smokeless tobacco products, pipes, and electronic cigarettes. All patients who indicated tobacco use in the past 30 days were automatically referred to an in-house tobacco treatment service staffed with tobacco treatment specialists. Patients interested in assistance participated in comprehensive treatment driven by an extensive tobacco clinical assessment. We compare screening, engagement, and treatment rates at baseline, in the first 6 months of 2018, and one year later, in 2019. **Results:** The percent of patients with documented tobacco use status increased from 9.14% to 87.67%. The percent of the patient population identified as current tobacco users increased from 1.76% to 11.92%; n=721 patients reported non-cigarette tobacco products (smokeless, hookah, pipe, and e-cigs). The number of patients engaged in tobacco treatment increased from n=199 to n=708. The number of patients who received NRT from the quitline increased from n=26 to n=52. In 2019, 21.13% of tobacco users engaged in tobacco treatment, including 15.53% of non-cigarette tobacco users. Patients primarily engaged in tobacco treatment delivered over the telephone and in group. **Conclusion:** Systematic improvements led to dramatically improved rates of screening, tobacco use identification, and increased engagement in tobacco treatment services.

FUNDING: Federal

PS3-82

DO ALL SMOKERS BELIEVE THAT NICOTINE CAUSES TOBACCO ADDICTION

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Background: Despite a near consensus among the scientific community that nicotine is primarily responsible for cigarette addiction (US Department of Health 2010), less is known about smoker's perceptions regarding nicotine's addictive properties. **Methods:** As part of the screening for another study (Perry et al. in press) 388 (194 male, 194 female) smokers responded to the following question: On a scale from 1 to 10, how much do you agree with "cigarette addiction is caused by nicotine?". Respondents also completed the Fagerstrom Test of Cigarette dependence (FTCD), rated their desire to quit smoking on a scale from 1-10 as well as provided basic their demographic characteristics (age, sex). **Results:** Although a majority of participants agreed with that nicotine causes tobacco addiction (mean=7.75, sd=2.39; median= 8/10; mode= 10/10, 38.9%) approximately 1 in 5 (21%) of participants gave a rating of 5/10 or below. While neither sex (p=0.962), nor FTCD score (p=0.252) predicted level of endorsement, relatively lower ratings were associated with a younger age (p=0.035) as well as a lack of interest in quitting smoking (p=0.008). A stepwise linear regression revealed that the model that best predicted participants' perceptions of nicotine's contribution to cigarette addiction included a single variable: level of interest in quitting smoking (F (1, 383) = 7.1; p=0.008) and that this three accounted for 1.8% of the total variance in participants' ratings. **Conclusions:** Findings suggest that smokers vary in their perceptions about nicotine's role in cigarette addiction. Because those who perceive nicotine to be less addictive tend to be less likely to plan to quit, such individuals may be particularly resistant to engaging in



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cessation efforts. Future efforts should be aimed at identifying the factors that underlie smokers' beliefs about nicotine's addictive properties as well as to determine the extent to which such beliefs impact various tobacco control initiatives.

FUNDING: Federal

PS3-83

ACUTE SELF-REPORTED PERCEPTIONS OF A CIGARETTE'S NICOTINE CONTENT PREDICTS ITS SUBSEQUENT CHOICE

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Introduction: Subjective perceptions (e.g., "liking") immediately upon smoking a cigarette likely predicts the reinforcing effects of that cigarette, although little controlled research has confirmed this association, particularly across cigarettes differing in nicotine content. **Methods:** In a within-subjects design, adult smokers (N=33) abstinent overnight were administered Spectrum cigarettes with nicotine contents of 1.3, 2.3, 5, 11, and 17 mg/g, just one per session in counter-balanced order across the 5 sessions, each compared with a 0.4 mg/g cigarette. These cigarette pairs were identified only by letter code to maintain blinding of administration. Each session started with 4 exposure trials, 2 for each cigarette, followed by 4 choice trials, with 20 mins between all trials. Exposure trials involved 4 puffs on one or the other cigarette, followed by rating perceptions of that cigarette on items asking how much "nicotine", "flavor", and "liking" was experienced, and how "satisfying" and "strong" it was (with each item on 0-100 VAS, combined as Acute Cigarette Perceptions scale, ACP). In the subsequent choice trials, all were instructed to take 4 puffs from any combination of the two cigarettes, now available concurrently, solely according to their preferences for each, for a total of 16 choice opportunities per cigarette pair. All smoking was carefully controlled via computerized instructions on puff timing and duration. Analyses related the magnitude of the difference in ACP ratings to the difference in subsequent choice behavior across the cigarette pairs varying in nicotine content. **Results:** Perception ratings and choice were greater as a function of increasing nicotine content, as expected. More importantly, the larger the difference in ACP, the greater the subsequent choice of the higher nicotine cigarette compared with the 0.4 mg/g, Wald $\chi^2(1)=21.91$, $p<.001$. However, the ACP x nicotine content interaction was also significant, Wald $\chi^2(4)=10.18$, $p<.05$, as the difference in ACP predicted choice for all the higher nicotine cigarettes (all Wald $\chi^2(1) >9.0$, all $p's<.005$), except for the 2.3 mg/g vs 0.4 mg/g (Wald $\chi^2(1)=1.40$, $p=.24$), likely due to a restricted range in ACP difference. **Conclusions:** Greater increases in acute cigarette perceptions predict greater self-administration of that cigarette in a choice procedure. Further research is needed to gauge applicability of this ACP measure in predicting the reinforcing efficacy of other cigarettes and under other self-administration procedures (e.g. ad lib consumption).

FUNDING: Federal

PS3-84

PREDICTORS OF ABSTINENCE IN SMOKERS WITH ASTHMA, COPD, DIABETES AND CARDIOVASCULAR DISORDERS VERSUS CONTROLS IN THE EAGLES STUDY

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Objectives: EAGLES was a randomized, double-blind, triple-dummy, placebo- and active-controlled (nicotine patch [NRT]; 21 mg per day with taper) trial of varenicline (1 mg twice a day) and bupropion (150 mg twice a day) for 12 weeks with a 12-week non-treatment follow-up conducted in 16 countries between Nov 30, 2011, and Jan 13, 2015. Participants were motivated-to-quit smokers with or without psychiatric disorders who received brief counselling at each visit (N=8144 in total). **Methods:** We examined predictors of abstinence in smokers with disorders induced and/or influenced by smoking i.e. self-reported asthma, chronic obstructive pulmonary disease (COPD), diabetes and cardiovascular disorders (n=1372) (designated "medical") versus controls without these comorbidities (n=6039) ("non-medical"). Smokers with cancer or alcohol dependence were excluded (n=733). We used a step-wise multiple logistic regression analysis with continuous abstinence in weeks 9-12 and 9-24 as independent outcomes. **Results:** Significant predictors of abstinence in weeks 9-12 were treatment with varenicline (odds ratio 3.84 [95% CI: 3.23-4.57]), bupropion (2.16 [1.81-2.59]) and nicotine patch (2.23 [1.86-2.67]), belonging to the non-medical group, white race, and non-US region. Terms inversely associated with abstinence included: female gender, Fagerström Test for Nicotine Dependence, having a prior quit attempt, prior use of bupropion, antipsychotic medication, contact with smoker, cigarettes/day last month, psychiatric medication, years smoked, lower age, and lower BMI. The odds ratio estimate for the medical vs.

the non-medical group was 0.80 (0.68-0.93). Predictors of abstinence in weeks 9-24 confirmed the above findings although with lower odds ratios for varenicline, bupropion and nicotine patch. **Conclusions:** Smokers with asthma, COPD, diabetes, and cardiovascular disorders had lower quit rates than smokers without these diseases indicating the need to address these smokers more intensely than with current treatments. **Funding source:** EAGLES was sponsored by Pfizer and GlaxoSmithKline

FUNDING: Pharmaceutical Industry

PS3-85

NATURALISTIC TOPOGRAPHY ASSESSMENT-CHALLENGES, OPPORTUNITIES, AND RECOMMENDATIONS

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SIGNIFICANCE: Smoking topography (ST), behavioral characterization of how individuals smoke, is associated with critical outcomes including toxicant exposure. Changes in ST by product provide an opportunity to examine variation in participant behavior and inform regulatory decisions. The Clinical Research Support System (CRSS) pocket device captures ST in a naturalistic setting using flowmeter technology via a mouthpiece connected to a tobacco product. We describe some of the challenges and advantages to using CRSS to measure ST in a naturalistic, prospective design. **METHODS:** As part of an ongoing nine-week randomized cross-over clinical trial evaluating the effect of cigarette filters on toxicant exposure, participants smoked using the CRSS for at least five-days weekly. Devices were calibrated and data downloaded at each visit and cleaned during a three-week washout period. Standard CRSS measurement specifications were utilized per manufacturer handbook, and adaptations made based on previous research. **RESULTS:** Five sequential test puffs were needed to consistently calibrate +/-2 mL across puffs and achieve 50-80mL/sec peak flow range and used software scaling correction factors as needed. Technical issues were found in three devices across four-participants, due to overheating or clogging that required a device repair or replacement of mouthpiece. Utilizing puff exclusion criterion of first puffs, volumes below 5mL, duration/interval(s) less than 100ms, or greater than 90s, were considered acceptable to consistently capture ST. Numerous data points of ST are generated for each participant; thus regular monitoring was imperative to ensure accuracy within set parameters/ranges. **CONCLUSION:** Utilizing the CRSS to measure ST in the natural environment is feasible. Challenges were found with calibration, technical issues, and data cleaning decisions. For ST variables to remain constant, data reduction of puff numbers is recommended. Device production time and repairs should be factored into study timelines. ST measurement is a useful tool to examine the impact of tobacco product characteristics on behavioral health outcomes and can inform regulatory decisions.

FUNDING: State

PS3-86

MODULATION OF WITHDRAWAL SYMPTOMS USING NICOTINE-FREE SMOKING SIMULATORS AND ALTERNATIVE NICOTINE DELIVERY SYSTEMS

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Significance. Global smoking cessation is one of major priorities put forward by WHO. However, heavy smokers experience psycho-emotional and physiological stress upon forced smoking cessation, e.g., during hospitalization, which decreases the effectiveness of medical treatment and requires an efficient circumvention. **Methods.** In the mentioned context, various nicotine-free smoking simulators (NFSS) and alternative nicotine delivery systems (ANDS), as well as their combinations were tested on a group of healthy smokers of similar age and body mass index. As NFSS, we examined nicotine-free e-cigarettes (EC) with various flavor cartridges and tobacco-free herbal cigarettes Nirdosh (used for Ayurvedic meditations), while ANDS referred to regular EC, tobacco heating systems and different types of snus. Volunteers were examined for their heart rate variability (HRV) with a VedaPulse® electrocardiograph (FDA certified) with innovative data processing algorithms. Based on a spectral analysis of the heart rate, the activities of the divisions of the autonomic nervous system (ANS) were studied, and indices of the morphofunctional state, stress, rate of biological aging and several others were calculated. **Results.** We have found that in actively smoking volunteers (> 20 pack-years of experience), significant changes in the balance of ANS and stress



indices occurred within an hour after the end of the previous smoking session, which correlated with an exacerbation of craving for smoking. With an increase in the abstinence duration, the activity of the sympathetic ANS division sharply increased, and the characteristics of various regulatory systems worsened. A significant (but short-term) correction of the psycho-emotional state of smokers can be achieved with the use of nicotine-free EC (up to 1-2 days). However, for long-term control of withdrawal symptoms, a combination of menthol-flavored aerosol NFSS with white snus has been proven best. **Conclusion.** Combining NFSS and ANDS tools furnish a promising approach for assisting the smoking cessation.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS3-87

CANCER PATIENTS' TOBACCO USE, READINESS TO QUIT, AND HELP SEEKING BEHAVIOR: EARLY IMPLEMENTATION OUTCOMES FROM A NCI-DESIGNATED CANCER CENTER

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Introduction: The risk of tobacco use after cancer diagnosis is profound while tobacco cessation is associated with many benefits, including evidence of a survival benefit. The NCI Cancer Center Cessation Initiative and foremost cancer care organizations recommend that every cancer patient is assessed for tobacco use, advised to quit, offered treatment and followed over time. Despite calls for a population-based, proactive approach to addressing tobacco use in cancer patients, few models for integration of tobacco treatment into cancer care exist and little is known about cancer patients' interest in these services. Method: At a NCI-designated cancer center in the southeast US, a new procedure for tobacco use screening and treatment referral was designed, piloted and implemented across all outpatient clinics in July 2018. Screening questions are consistent with NCI-AACR recommendations and answers are documented in electronic medical records. An opt-out treatment approach is used. The goal was to achieve 100% reach, such that every patient is asked about tobacco use and current users are offered counseling, medication, and other support. Results: From July 2018 to June 2019, 13,881 adult patients were seen and everyone was screened for tobacco use. Lifetime tobacco use was reported by 43.7% of patients. Current (past month) tobacco use occurred in 47.4% of lifetime users or 22.7% of the population; cigarettes were the most popular product followed by smokeless tobacco. Only 17.5% of current users accepted an offer of "help with tobacco cessation", with 65.5% of decliners citing that they were "not ready to quit". Females ($p < .05$) and patients in the breast or multidisciplinary clinic ($p < .05$) were more likely to accept treatment than others; age ($p = .37$) and race/ethnicity ($p = .23$) were not associated with this outcome. Conclusions: Despite cancer diagnosis being theorized as a "teachable moment"-a time when motivation to adopt health-promoting behaviors is high-many cancer patients were not ready to quit and declined tobacco treatment. Clinically proven strategies to increase motivation, prompt quit attempts, and encourage treatment use are warranted in cancer patients.

FUNDING: Federal

PS3-88

REDUCTION IN NICOTINE CONTENT DIMINISHES A CIGARETTE'S ACUTE RELATIVE REINFORCING EFFICACY

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Introduction: The U.S. FDA may reduce the maximum allowable nicotine content in cigarettes, with the aim of helping prevent youth from becoming dependent smokers and to make it easier for established smokers to quit. However, unclear is what that maximum nicotine content should be. Methods: To inform clinical research on nicotine reduction, this laboratory-based study used a within-subjects forced choice paradigm to assess dose-related declines in acute nicotine reinforcement in dependent adult smokers ($N=33$; 19 M, 14 F). Spectrum research cigarettes of varying nicotine contents (17, 11, 5, 2.3, and 1.3 mg/g; just one of the five "NIC" doses per session, with the 5 sessions in counter-balanced order) were compared to a very low nicotine content cigarette ("VLNC"; 0.4 mg/g). Cigarettes were mentholated based on participants' preference. Each session, after overnight abstinence, began with four 4-puff exposure trials (2 each with NIC or VLNC alone), followed by four choice trials in which the NIC and VLNC cigarettes were presented concurrently. Participants were instructed to take four puffs from any combination of the two cigarettes they wanted, for a total of 16 choices per session. All smoking was done using computer-instructed controlled puffing (via CReSS) under blind conditions, with 20 mins between trials. Choice of NIC vs VLNC indexed the relative reinforcing effects of nicotine per session. Results: Unexpectedly, there was a significant interaction of nicotine content X menthol preference on choice,

Wald $\chi^2(4) = 11.52$, $p=0.02$, suggesting a differential pattern of reinforcement across doses due to menthol. Consequently, primary analyses tested menthol and non-menthol groups separately. In the non-menthol group, the main effect of nicotine content was significant, Wald $\chi^2(4) = 13.35$, $p=0.01$, as expected. Relative to the 0.4 mg/g comparison, choice was significantly greater for doses ≥ 5 mg/g vs. those ≤ 2.3 mg/g. For the menthol group, the nicotine content main effect was not significant, Wald $\chi^2(4) = 6.40$, $p=0.17$, perhaps due to variable menthol contents across the nicotine contents. Conclusions: Although added study with larger samples and other methods is needed, reducing nicotine contents to levels ≤ 2.3 mg/g may attenuate reinforcement—very consistent with dose-related smoking reduction reported in a recent clinical trial with these Spectrum reduced nicotine cigarettes. Independently manipulating menthol and nicotine contents may also be needed to address concern about acute comparisons between Spectrum menthol cigarettes.

FUNDING: Federal

PS3-89

REASONS FOR USE AND PERCEIVED ADVANTAGES AND DISADVANTAGES OF USING E-CIGARETTES AMONG AFRICAN-AMERICAN SMOKERS

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Significance: African-Americans (AA) are underrepresented in the majority of e-cigarette (EC) studies. In studies where ECs are provided for the purpose of switching smokers from cigarettes to ECs, little is known about use of ECs by AA or attitudes and beliefs about these products. Methods: The current study is a secondary analysis of a randomized clinical trial in which 92 African-American daily cigarette smokers who were interested in switching to ECs were randomized 2:1 to 6 weeks of EC ($n=62$) or 6 weeks of cigarettes as usual (no EC, $n=30$). Reasons for EC use and pros and cons of ECs are described for those in the EC group who completed the week 6 survey ($n=60/62$, 97%). Results: Participants ($n=60$) were 51 years of age ($SD=9$), female (53%), low income (82% at or below 200% poverty line), and menthol smokers (82%) who had smoked cigarettes for 19 years ($SD=14$). At week 6, 55/60 (92%) of the EC group reported use of ECs in the previous 4 weeks. The three primary reasons for using ECs were to cut down on cigarettes (100%), as an alternative to quitting tobacco (98%), and because they were more acceptable to non-tobacco users (98%). The three primary advantages were smelling better (77%), cutting down on cigarettes (75%), and social acceptance (73%). Conversely, only two primary disadvantages were cited; experiencing ongoing craving for cigarettes (22%) and difficulty being around cigarette smokers (11%). Conclusions: Findings are promising in that they are counter to some previous studies that have characterized ECs as unsatisfactory to AA smokers. Exclusive use of ECs among AA smokers has the potential to narrow the gap in tobacco-related health disparities. Future research into benefits and drawbacks of ECs and whether individuals switch fully, partially, or not at all is needed.

FUNDING: Federal

PS3-90

JUUL DEPENDENCE, PERCEPTIONS OF QUITTING AND PREFERRED CESSATION RESOURCES AMONG COLLEGE STUDENTS

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Significance: JUUL is a pod-based e-cigarette delivering high nicotine content. College students show high rates of JUUL, highlighting a critical need for information about dependence, perceptions of quitting, and preferred cessation resources among JUUL users to inform prevention, treatment, and regulatory efforts among this at-risk group. Method: Students at two southern California universities ($N = 1,001$; M age = 20.2; 64.6% female; 34.7% Latinx, 31.3% Asian/Pacific Islander 19.1% non-Hispanic white; 45.5% < \$50k family income) completed an electronic survey from February to May 2019. The survey asked about history of JUUL use, time to first JUUL use, purposeful JUUL quit attempts, confidence in quitting JUUL, and preferred JUUL cessation resources. Descriptive analyses characterized ever-JUUL users with a purposeful quit attempt and chi-square analyses tested differences between past 30 day and > 30 day users. Results: Overall, 28.8% of the sample reported ever using JUUL, with 46.2% of this



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sub-group reporting last use within the past 30 days and 53.8% reporting last use over 30 days ago. Nearly half (47.8%) of JUUL ever-users reported making a deliberate quit attempt, and among those doing so, 33.0% reported time-to-first JUUL use within 60 minutes, 31.8% reported quitting or reducing JUUL as "very or somewhat" difficult and 35.8% reported quitting confidence scores as less than "very confident." Those reporting a previous deliberate quit attempt also expressed interest in a variety of resources to quit or reduce JUUL, including a smartphone app (35.6%), text messages (32.6%), doctor appointment (29.6%), and medication (24.2%). Past-30-day users displayed shorter time to first JUUL use ($p = .012$) and greater difficulty cutting down or quitting JUUL compared to > 30 day users ($p = .000$). **Conclusion:** In a diverse sample of college students with a history of JUUL use, nearly half displayed interest in quitting or reducing JUUL, and approximately a third displayed risk characteristics associated with JUUL dependence, indicating a need for cessation support. Technological and traditional methods to support JUUL cessation both appear acceptable to college students.

FUNDING: Unfunded

PS3-91

A SYSTEMATIC REVIEW OF TOBACCO SMOKING CESSATION INTERVENTIONS FOR PREGNANT WOMEN WITH SUBSTANCE USE DISORDER

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Significance: A combination of maternal nicotine and substance use has significant, additive adverse effects on fetal/newborn development. Despite reported desires to stop tobacco use, cessation efforts by pregnant women dependent on substances are impeded by prioritised substance use treatment, strong nicotine-dependence, comorbid conditions, synergistic effects of tobacco and substances, stigma, partner smoking and inadequate targeted cessation treatment. This review provides the first comprehensive synthesis of smoking treatments for pregnant women with concurrent substance and tobacco use disorders. **Methods:** A systematic review of health and psychology databases, including grey literature was conducted in June 2019. All studies, of any design methodology, that quantitatively reported changes in smoking behaviors of women treated for maternal substance use were included. Interventions were any psychological, behavioral and/or pharmacological treatments used to treat tobacco use. **Results:** Of 1837 retrieved papers, six interventional studies were identified (two RCT's, four pilot/program-evaluations). Three were counselling-based, two were incentive-based and one involved education and cessation treatment referral. Only one (incentive-based RCT), impacted abstinence with 31% of participants considered smoke-free at some point during the intervention. All interventions substantially reduced cigarette consumption. Other outcomes included decreased depression/anxiety, decreased carbon-monoxide levels, increased motivation to quit and enhanced tobacco-related knowledge. **Conclusion:** Few tobacco treatments aimed at improving smoking rates exist for this health-disparate group. It appears that interventions designed to treat cessation in general maternal populations may not address the complex needs of women with comorbid substance and tobacco use. The results demonstrate the need for tailored interventions that reduce barriers to smoking cessation. Incentive-based interventions appear to have the most success. A focus on innovative treatments embedded in a holistic, supportive system of health provision should be considered to improve the health outcomes of high-priority pregnant women who smoke tobacco.

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PS3-92

E-CIGARETTES FOR SMOKING CESSATION AND HARM REDUCTION IN ALCOHOL AND OTHER DRUG TREATMENT

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Significance. Smoking is very common among people with alcohol and drug misuse, and cessation treatments only moderately effective. The prevalence of e-cigarette use in people accessing alcohol and drug dependence treatment is reportedly increasing but unknown in New Zealand. Neither do we know the attitudes of treatment providers towards these products. We aimed to assess if e-cigarettes would be a feasible and acceptable smoking cessation and harm reduction option in alcohol and other drug (AOD) treatment settings. **Methods.** We undertook an online survey of AOD service providers and a survey of service users, both in 2018. Service providers were contacted through a membership association of addiction practitioners in NZ and an email link to an online survey sent to all registered practitioners within the Auckland, NZ area.

Service users were contacted through an addiction treatment provider. An offline tablet was provided for the service users to complete a questionnaire regarding their opinions of e-cigarettes in AOD treatment. **Results.** Of the 29 service providers who responded of the 538 contacted, 94% reported they believed e-cigarettes should have the same restrictions for their use that tobacco cigarettes have, such as being used offsite or after the service users' appointment. Two-thirds (67%) of service providers reported the service users should provide their own e-cigarettes; 72% thought that if e-cigarettes were to be vaped by service users, they should contain nicotine. Among service users, 73% thought e-cigarettes should be available to help smokers cut down or quit; 53% supported having the same restrictions for the e-cigarettes as tobacco; 39% thought service users should provide their own e-cigarettes. **Conclusions.** E-cigarettes are broadly acceptable to the service providers and service users who took part, so potentially could be used in these settings. Wider consultation is needed with both providers and service users and an e-cigarette implementation framework suitable within an AOD treatment context required.

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PS3-93

A META-ANALYSIS OF CRAVING CUE REACTIVITY IN DAILY TOBACCO CIGARETTE SMOKERS

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Significance. The cue reactivity paradigm allows for systematic evaluation of motivational responses to drug-related cues that may elicit drug use. The literature on this topic has grown substantially in recent decades, and the methodology used to study cue reactivity has varied widely across studies. Our understanding of this key feature of tobacco use disorders will be advanced by a programmatic investigation of variables that have an impact on cue reactivity effects. **Methods.** A meta-analysis was conducted using studies with daily cigarette smokers using a cue reactivity paradigm that utilized tobacco cigarette and neutral cues. A total of 173 effect sizes were analyzed using a random effects model to investigate the magnitude of the craving effect and potential moderators. **Results.** The aggregate effect size was moderate-to-large, Hedges' $g = 0.66$, $SE = 0.03$, 95% CI [0.60, 0.73], $Z = 19.81$, $p < .001$, indicating that drug cues produced significantly greater craving than neutral cues. However, the effect sizes were significantly heterogeneous across studies, $Q(139) = 1184.85$, $p < .001$. No participant-centered moderators (gender, treatment seeking status, abstinence, or cigarettes per day) significantly altered the effect, ($ps > .21$). Several cue characteristics were significantly associated with the magnitude of effects including cue modality ($p < .001$), cue reactivity environment (EMA vs. Laboratory, $p = .004$), and cue personalization ($p < .001$). Methodological factors such as cue order, cue availability, single vs. multi-item craving measures, and baseline vs. neutral comparisons were non-significant ($ps > .05$). **Conclusions.** The results underscored the strength of self-reported craving as an index of cue reactivity across studies. The robustness of this effect supports theories that posit cue reactivity is core to the addictive process for daily tobacco cigarette smokers. The present research further elucidates the participant, cue, and methodological variables that alter the cue reactivity effects across studies. These findings lead to a better understanding of this paradigm and identify factors that may modulate addictive motivation for tobacco cigarettes.

PS3-94

ANXIETY SENSITIVITY AND EXPERIENTIAL AVOIDANCE PREDICT THE ACUTE SUBJECTIVE EFFECTS OF SMOKING IN AFRICAN AMERICANS DURING TOBACCO NON-ABSTINENCE

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SIGNIFICANCE: Anxiety sensitivity (AS), the tendency to fear anxiety-related experiences, has been associated with the development of emotional disorders and with indicators of smoking motivation and maintenance. Prior work has also suggested that experiential avoidance (EA), the tendency to avoid negative internal experiences, may contribute to AS relations with emotional disorders and smoking processes. To our knowledge, however, no prior study has examined if AS and EA predict the acute subjective effects of smoking in African Americans. **METHODS:** African American daily cigarette smokers ($N = 399$; 38.6% female; 10+ cigs/day) completed self-report measures, including measures of AS and EA, during a baseline session. Participants then were asked to smoke as usual before a subsequent experimental session. At the start of the experimental session, tobacco non-abstinence was biochemically verified,



and each participant smoked one cigarette of their preferred brand in the laboratory. Self-report measures of state affect and cigarette craving were completed before and after smoking, and post-cigarette subjective effect ratings were provided. Linear regression models controlled for baseline dysphoria symptoms, education level, and cigarette dependence severity (and for repeated measures, corresponding pre-cigarette scores). **RESULTS:** AS predicted smaller smoking-induced reductions in negative affect ($\beta = .12, p = .016$) and urge to smoke to avoid negative affect ($\beta = .11, p = .03$), whereas EA predicted greater smoking-induced reductions in negative affect ($\beta = -.14, p = .007$), greater post-cigarette psychological reward ($\beta = .15, p = .013$), and smaller smoking-induced reductions both in craving to smoke for pleasure ($\beta = .11, p = .026$) and in having difficulty resisting the urge to smoke when given the opportunity ($\beta = .18, p < .001$). **CONCLUSIONS:** Current findings suggest that though AS and EA are related constructs, they may differentially modify the acute subjective effects of smoking in African Americans, at least during tobacco non-abstinence not involving a stressor.

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PS3-95

BRAIN AND BEHAVIORAL IMPACT OF EMOTIONAL SALIENCE OF CIGARETTE WARNING LABELS ON ADOLESCENTS AFTER REPEATED EXPOSURE

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Background: Adolescence is a critical period for smoking prevention, however, objective data on response to prevention efforts in adolescents lags behind. Graphic warning labels (GWLs) on cigarette packs are a common prevention strategy. Yet, GWLs implementation in the US has been challenged on constitutional grounds, with its emotional content being one of the flashpoints of the debate. We experimentally tested how the emotional content of GWLs affects cognitive processing in adolescents. **Methods:** Participants were exposed daily to GWLs previously rated high or low on the emotional reaction scale (High ER vs. Low ER), over a 4-week period. Brain responses to GWLs were recorded using functional magnetic resonance imaging (fMRI) before and after the exposure period. Memory for GWLs images and texts was tested respectively. **Results:** After exposure, brain response to high ER GWLs was reduced in the amygdala, putamen, hippocampus, and superior frontal gyrus, while brain response to low ER GWL was reduced in the amygdala, hippocampus, anterior cingulate and thalamus. Their performances in the recall task revealed that images from High ER GWLs were better recalled than these from the Low ER GWLs ($p=0.01$), while there was no difference in recall of the text ($p=0.08$) at the baseline. After 4-week repetitive exposure, the recall of images and text remained unchanged ($p=0.07$ and $p=0.68$) in the High ER GWL group, and the recall of images improved significantly ($p=0.01$) while recall of text was unchanged ($p=0.38$) in the Low ER GWLs group. **Conclusions:** These preliminary results show that baseline brain response to GWL in adolescents is similar to one reported in adults. However, unlike adult smokers, the emotional salience of GWLs did not facilitate cognitive processing of textual warnings in adolescents.

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PS3-96

EVALUATION OF TREATMENT MECHANISMS FOR VARENICLINE: PRELIMINARY EVIDENCE FROM A RANDOMIZED CLINICAL TRIAL

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Preclinical, human behavioral pharmacology, and clinical studies indicate varenicline (VAR) alters several processes, from reinforcement to craving and facets of withdrawal. However, little research has formally evaluated the extent to which these changes actually account for, or mediate, the effect of VAR on quitting smoking. The present study examines two critical paths for testing treatment mechanisms: Path A concerns the effect of VAR (versus placebo) on changes in potential mediators during quit attempts, and Path B tests the extent to which those changes in potential mediators predict quit status. Data was collected from 732 smokers randomly assigned to VAR or placebo in a prior clinical trial (NCT01314001). Candidate mechanisms (craving, negative and positive affect [NA, PA], sleep problems, somatic complaints) were derived from self-report measures completed 1 week pre-quit, on target quit day, and at 1 and 4 weeks post-quit using an explicit measurement model (Tonkin et al., 2019) developed

to minimize the typical conceptual and statistical overlap among these domains. As in the parent trial, bio-verified abstinence was assessed at end of treatment (EOT; 11 weeks post-quit). Repeated measures ANOVAs evaluated Path A: Across time, smokers assigned to VAR had attenuated rises in NA (linear $p < .01$), steeper declines in craving (linear $p < .01$; quadratic $p = .01$), and steeper increases in sleep problems (linear $p = .02$), compared to placebo. PA and somatic complaints were not significantly related to treatment group ($ps > .36$). Logistic regressions tested Path B: Abstinence at EOT was associated with smaller increases in NA (linear $p < .01$) and greater declines in craving (linear $p < .01$); both effects remained significant when entered into the same model. Changes in sleep problems were not significantly related to abstinence ($p = .08$), suggesting that VAR-related changes in sleep do not play a strong role in cessation at EOT. In summary, the present findings provide evidence that changes in NA and craving may play a mechanistic role in the effects of varenicline for smoking cessation. This hypothesis will be further evaluated in forthcoming analyses.

FUNDING: Federal

PS3-97

THE SHORT TERM EFFECTIVENESS OF REAL-TIME VIDEO COUNSELLING ON SMOKING CESSATION AMONG SMOKERS RESIDING IN RURAL AND REMOTE AREAS

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Significance: Real-time video counselling for smoking cessation can be delivered using software such as Skype and FaceTime directly to smokers at home. Such technology may be particularly beneficial to smokers who live in rural and remote areas as it overcomes distance-related barriers to accessing smoking cessation treatment, with visual interaction. **Objective:** This study aims to assess the short-term effectiveness of real-time video counselling compared to telephone counselling or written materials (control) on smoking cessation and quit attempts in smokers living in rural and remote areas. **Methods:** Smokers were recruited via online and traditional methods into a three-arm, parallel group randomised trial and were randomly allocated to either; 1) real-time video counselling; 2) telephone counselling; or 3) written materials. Video and telephone counselling conditions were offered six counselling sessions while those in the control condition were mailed written materials. A follow-up assessment occurred at 4-months post-baseline. **Results:** A total of 655 participants were recruited between 25 May 2017 and 2 October 2018. Most were female (77.4%), married (55%), employed (59%) and lived in inner regional areas (73%). Between the baseline and 4 month surveys almost 70% made a quit attempt across the three conditions. The 7 day point prevalence abstinence rate at 4 months appears promising and comparisons between the video counselling, telephone counselling and written materials groups will be presented. **Conclusion:** The findings suggest that video counselling is a promising approach for delivering smoking cessation support to those who live in rural and remote areas.

FUNDING: State; Nonprofit grant funding entity

PS3-98

MOTIVATIONAL INTERVIEWING PRODUCES CHANGE TALK IN SMOKERS WITH SERIOUS MENTAL ILLNESS DISCUSSING TOBACCO USE

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Abstract

Significance: Change talk (CT), or client language that is consistent with making a behavioral change, has been found to contribute to Motivational Interviewing's (MI) efficacy. It is not yet known, however, if change talk helps to explain MI's effect on instigating a quit attempt in smokers with serious mental illness. **Methods:** We analyzed the proportion of CT and sustain talk (ST) within a single session adaptation of motivational interviewing (AMI) for smoking cessation or an interactive education intervention. We predicted that there would be a higher proportion of CT and a lower proportion of ST in the AMI condition. **Results:** Our hypothesis was supported. Participants receiving the AMI condition had higher proportions of CT and lower proportions of ST than the interactive education condition. **Conclusions:** Our study is the first to show that motivational interviewing has the same change talk augmenting effect in individuals with SMI as those without SMI.



Given that anhedonia, negative affect, and depressive symptoms are a major part of schizophrenia, schizoaffective disorder, and bipolar disorder (American Psychiatric Association, 2013), it is encouraging that MI can generate change talk in this population. Future smoking cessation studies with larger samples should investigate whether greater amounts of CT lead to increased quit attempts in this population. **Keywords:** motivational interviewing, serious mental illness, smoking, cessation, change talk

FUNDING: Federal

PS3-99

THE TIME COURSE OF SALIVA VARENICLINE CONCENTRATIONS DURING SMOKING CESSATION - INITIAL DATA FROM A RANDOMIZED CLINICAL TRIAL

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SIGNIFICANCE: Previous research on relationships between varenicline (VAR) concentrations and adherence and smoking cessation has generally been limited to one-time assessment of VAR. Because these processes unfold over time, the present study examined the time course of VAR concentrations assessed after 1, 3, and 5 weeks of treatment. Given that standard VAR dosing increases across the first two weeks of treatment (0.5 mg qd x 3 days; then 0.5 mg bid x 4 days; then 1 mg bid), we hypothesized that VAR concentrations would continue to rise from Week 1 to 3 and then plateau from Week 3 to 5. Based on sex differences in VAR treatment response and side effects, we predicted that VAR concentrations would be higher among women than men. **METHODS:** Participants were the first 43 adult treatment-seeking smokers (>10 CPD; 22 female; mean[SD] age=55[9] years) who completed all visits without a medication reduction in an ongoing randomized controlled trial (NCT03262662). Saliva samples collected 1, 3, and 5 weeks after initiation of VAR were assayed for VAR concentrations via LC/MS. **RESULTS:** At each visit, about 98% of the sample had detectable VAR concentrations (≥ 1 ng/mL). However, the data were characterized by marked heterogeneity and non-normality (e.g., at Week 5, VAR mean=50 ng/mL; range=0-420). Gender x Week ANOVAs were conducted for both raw VAR concentrations and data normalized via log transformation. As predicted, VAR concentrations rose from Week 1 to Week 3, raw and log $ps < .001$, $\eta_p^2s > .42$. Log, but not raw, VAR concentrations tended to decline from Week 3 to Week 5, $ps = .09$ and $.76$, $\eta_p^2s = .07$ and $.00$. As hypothesized, VAR concentrations were higher among women than men across all assessments, $ps < .03$, $\eta_p^2s = .12$ for raw and log data; the gender difference did not significantly vary across weeks, all $ps > .12$. **CONCLUSION:** These data demonstrate that VAR concentrations continue to rise beyond 1 week of VAR therapy, the typical time at which patients are instructed to quit. Thus, the time course of VAR concentrations may inform the optimal timing of quit attempts. Future analyses will evaluate the degree to which individual differences in VAR concentrations (i.e., the observed sex difference) and variability in concentrations over time inform our understanding of adherence, side effects, and treatment outcomes.

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PS3-100

CONNECTIVITY OF REALTIME VIDEO COUNSELLING VERSUS TELEPHONE COUNSELLING FOR SMOKING CESSATION IN RURAL AND REMOTE AREAS

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Significance: Real-time video software (e.g. Skype, FaceTime) is widely available and facilitates virtual face-to-face communication. However quitlines have not implemented real-time video counselling into routine practice. A potential barrier may be the perceived connectivity of video communication technology compared to telephone. **Objective:** This study aims to investigate the connectivity of video sessions compared to telephone sessions delivered to smokers in rural and remote areas. **Methods:** Participants were recruited into a randomised trial in which two arms offered: a) real-time video counselling or b) telephone counselling to assist smokers to quit. Participants were offered up to six

video or telephone sessions. On completion of each video or telephone session, the smoking cessation advisor recorded the connectivity of that call. **Results:** A total of 456 video counselling sessions and 587 telephone counselling sessions were completed. The findings show adequate connectivity of the video intervention in rural locations with no echoing noise in 98% of video sessions, and no difficulty seeing the participant and no loss of internet connection in more than 87% of video sessions. In more than 95% of telephone calls there was no echoing noise, no difficulty hearing the participant and no loss of telephone line connection. **Conclusion:** The connectivity of real-time video counselling and telephone counselling for smoking cessation appears acceptable in rural and remote areas. Quitline providers could consider a video counselling option as part of their routine services.

FUNDING: State; Nonprofit grant funding entity

PS3-101

USING THE CIGARETTE PURCHASE TASK TO EXAMINE THE RELATIVE REINFORCING VALUE OF CIGARETTES AMONG MOTHERS WITH VERSUS WITHOUT OPIOID DEPENDENCE

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Significance: The Cigarette Purchase Task (CPT), in which participants estimate the number of cigarettes that they would smoke across increasing cigarette prices, measures the relative reinforcing value of cigarettes. Although opioid-dependent individuals are particularly vulnerable to tobacco addiction, more research is needed to elucidate whether and to what extent their motivation to smoke differs from other not-opioid dependent smokers with similar sociodemographic characteristics. **Methods:** Participants were 173 women (65 opioid-dependent) in an ongoing clinical trial for smoking cessation. CPT responses collected at a baseline intake assessment prior to treatment were compared between among opioid-dependent (i.e., enrolled in opioid-substitution therapy) versus not-opioid dependent women using five demand indices: Demand Intensity; O_{max} ; P_{max} ; Breakpoint (BP); and α , and two latent factors: Demand Amplitude and Persistence. Final regression models adjusted for sociodemographic and smoking characteristics that differed between the two groups. **Results:** Opioid-dependent women had significantly higher Demand Intensity (i.e. number of cigarettes they would smoke if cigarettes were free) than not-opioid dependent women, even after controlling for sociodemographic and smoking characteristics in the final regression model ($F(1, 156) = 6.93, p = .016$). No other significant differences were observed for individual demand indices. Demand Amplitude (i.e., volumetric consumption), but not Persistence, was significantly higher for opioid-dependent women, even in the final model ($F(1, 146) = 4.04, p = .046$). **Conclusion:** The current study further demonstrates that the CPT is a highly sensitive task that can illuminate potentially important individual and population differences in the relative reinforcing value of smoking. The present results indicate that greater Demand Intensity and Amplitude for cigarettes differentiates smokers with versus without comorbid opioid dependence. Thus, decreasing the high smoking prevalence among opioid-dependent populations is likely to require interventions and policies that decrease Demand Intensity and Amplitude.

FUNDING: Federal; Nonprofit grant funding entity

PS3-102

FEASIBILITY AND EFFECTIVENESS OF USING THE VETERANS AFFAIRS-VIRTUAL MEDICAL CENTER FOR TOBACCO SUPPORT GROUP

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SIGNIFICANCE: The high prevalence of tobacco use among Veterans results in well-documented adverse health and economic burdens. Along with medications, behavioral support groups are the most effective way for Veterans to stay tobacco-free. The Veterans Affairs Virtual Medical Center (VA-VMC) is a Virtual Reality (VR) platform where Veterans and providers can communicate in real-time using an avatar. This pilot study explores the feasibility and effectiveness of utilizing the VA-VMC for the Virtual Tobacco Support Group (VTSG), which requires computer access and mitigates travelling limitations. **METHODS:** Referrals to VTSG were made from tobacco treatment clinics from August 2018 to July 2019. The VTSG is 1-hour and facilitated by a nurse, physician



or psychologist. All participants completed a 5-point Likert scale regarding their experience with the VTSG. Veterans unable to participate identified their barriers. **RESULTS:** We received 77 referrals to VTSG and 15.8% (n=12) were able to participate in VTSG through the VA-VMC. The participants were 83.3% male with a mean age of 55. Four (33.3%) are still current smokers. Five (41 %) used nicotine replacement therapy and 75% (n=9) used oral medications. The average CES-D Score was 22 (SD = 11.5) and the average Fagerstrom score was 7.67 (SD=3.1). We conducted 40-weekly sessions in 11-months, with an average of 3 Veterans in attendance per session (range 1-8). Out of 12 participants, five (41.7%) attended more than 3 sessions. Scheduling conflicts was the most common reason for 67% (8/12) of Veterans attending 1-3 sessions. Veterans' rating of the VTSG experience on a 5-point Likert scale are as follows: helpfulness of the group 3.5 (SD=1.12), ease of VR setup 4 (SD=0.77), likely to participate in a VR group in the future 2.4 (SD=1.29), engagement 3.9 (SD=1.27), and overall experience 3.5 (SD=1.13). The common reasons for not participating were: lost to follow-up (32.8%, n=21), unable to contact (21.9%, n=14), and various scheduling conflicts (20.3%, n=13). **CONCLUSION:** Although the overall experience of VTSG was positive for Veterans, technical difficulties and scheduling conflicts resulted in low participation rates among high-risk smoking Veterans.

FUNDING: Federal; Academic Institution

PS3-103

IMPACT OF ALCOHOL AND DRUG USE ON SMOKING AND CESSATION IN SOCIOECONOMICALLY DISADVANTAGED YOUNG ADULTS

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INTRODUCTION: Population studies highlight that alcohol and marijuana use are correlated with cigarette smoking and other tobacco use. Using qualitative data from focus groups, the aims of our study were to describe the ways in which alcohol and drug use affect cigarette smoking and cessation in socioeconomically-disadvantaged young adults (SDYA) smokers. **METHODS:** Thirty-six SDYA smokers aged 18-29 participated in eight focus groups and two interviews in Burlington, Vermont in 2018. Structured focus groups addressed poly-tobacco use, other substance use and co-use with tobacco, and the contexts and facilitators that cue SDYA smoking. Participants were also asked their reasons for smoking, barriers to cessation and messages or modalities that would make smoking cessation more novel or relevant. Three coders implemented the Framework Method analysis to create a comprehensive coding structure based on pre-assigned transcripts, then one coded all study transcripts using NVivo software (QSR International). **RESULTS:** Key themes emerged around the relationships between alcohol and drug use and smoking. SDYA smokers discussed co-use of tobacco and other substances stating that cigarettes go "hand in hand" with drugs and alcohol. Participants described changes in frequency of smoking when using other substances, including chain smoking when drinking and substituting cigarettes with marijuana. Several SDYA smokers with a history of addiction credited cigarettes as their last remaining addiction, and feared that quitting smoking would cause relapse to alcohol or drugs. **DISCUSSION:** Co-use of cigarettes with alcohol and other drugs was a prominent theme that emerged from focus groups. Participants frequently highlighted substance use as a reason for smoking and a barrier to quitting. SDYAs reported smoking and craving cigarettes more when using other substances, cigarette smoking as a factor in sobriety from alcohol and drugs, and concern that quitting smoking would trigger drug or alcohol relapse. Interventions that address substance co-use may improve smoking cessation in SDYA smokers.

FUNDING: Federal

PS3-104

ANALYSIS OF THE REACH OF A PROACTIVE APPROACH TO OFFERING SMOKING CESSATION TREATMENT TO ADULT PRIMARY CARE PATIENTS

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Significance: Underutilization of evidence-based smoking cessation treatment remains a critical barrier to improved health for adults who smoke. Although smoking is frequently assessed in healthcare settings, rates of engaging patients who smoke in smoking cessation treatment and follow-up are still low. Centralized, proactive outreach may complement and extend primary care efforts to engage patients who smoke in treatment

and increase the reach of smoking cessation interventions. **Methods:** A novel Tobacco Outreach Specialist role was created in a health cooperative to engage all adult patients who smoke in treatment through phone, mail, and electronic health record (EHR) patient portal outreach. EHR tools to support primary care provider intervention and Tobacco Outreach Specialist efforts were also developed. The proactive care model was rolled out in 6 clinics over 11 months. The reach of both clinician-delivered and Outreach Specialist-delivered support was computed using data extracted from the EHR. **Results:** During primary care encounters, proactive outreach by the clinician engaged 8.8% of adults who smoked in setting a date to quit smoking. Phone contact from Outreach Specialists effectively engaged another 6.5% of patients who were not ready to quit at a clinic visit 1-2 weeks earlier. Tobacco Cessation Specialists were able to set a quit date and help set a quit plan for 10.8% of the adults who smoke who had not been seen in clinic for more than a year that they attempted to reach. Among all patients who set a quit date, Outreach Specialists were able to counsel 48.8% by phone 2-5 days pre-quit, 44.9% 3-7 days post-quit, and 45.7% 4-6 weeks post-quit. Among those reached for these Tobacco Outreach Specialist follow-ups, between 18.6% and 27.4% elected to set a new quit date for an additional quit attempt. At the 4-6 week post-quit follow-up, 21.4% of patients reported that they were no longer smoking. **Conclusions:** Proactive outreach can engage more than 1 in 7 adult patients who smoke in planning a quit attempt with the help of a clinician or tobacco outreach specialist. This model has potential to enhance patient engagement in smoking cessation.

FUNDING: Federal

PS3-106

GENDER, ANXIETY SENSITIVITY, AND EXPERIMENTAL PAIN REACTIVITY AMONG TOBACCO CIGARETTE SMOKERS

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Pain and tobacco cigarette smoking are prevalent and frequently co-occurring conditions hypothesized to interact in the manner of a positive feedback loop, resulting in greater pain and the maintenance of cigarette dependence. Anxiety sensitivity (fear of arousal-related sensations) is thought to amplify propensity to escape/avoid painful stimuli, and has been positively associated with sensitivity to experimental pain. Despite evidence that anxiety sensitivity functions as a transdiagnostic vulnerability factor in comorbid pain and smoking, no work has examined this factor as a predictor of pain reactivity among smokers. Participants included N = 99 daily cigarette smokers (30% female; $M_{Age} = 36.5$; $M_{CPD} = 9.1$, $SD = 7.9$) recruited for a primary study of bidirectional pain-alcohol effects among moderate-to-heavy drinkers. Anxiety sensitivity was assessed using the Anxiety Sensitivity Index-3 (ASI-3), and contact-heat pain threshold/tolerance was tested using a Medoc Q-Sense device. Given observed sex differences in anxiety sensitivity and pain, gender was tested as a moderator in all models. After adjusting for covariates (cigarette dependence, race, years smoked, education, marital status, and generalized anxiety), results revealed an anxiety sensitivity by gender interaction ($p < .01$), such that greater anxiety sensitivity was associated with lower pain threshold among female, but not male smokers. Examination of ASI-3 subscales revealed that physical concerns predicted lower threshold only among female participants ($p < .001$). Both ASI-3 total scores and the somatic concerns subscale were inversely associated with pain tolerance among all smokers ($ps < .05$). This is the first study to show that higher anxiety sensitivity predicts greater reactivity to experimental heat pain among smokers, and that such effects be especially prominent among female smokers. These findings contribute to a growing literature indicating that anxiety sensitivity is an important transdiagnostic factor in pain and smoking, and future research is needed to extend these findings to smokers with varying levels of alcohol consumption.

FUNDING: Federal

PS3-107

IMPACT OF JUUL USE ON SALIVARY CYTOKINES AMONG COLLEGE STUDENTS

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Significance: Conventional tobacco use alters immune function, contributing to adverse respiratory health effects. Despite unknown long-term health effects of electronic cigarettes (e-cigs), use has dramatically increased in the emerging adult population (ages 18-25). Although e-cig aerosol has been associated with altered cell function, most specifically in the lungs, few studies have examined the effects of e-cig use on



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cytokine profiles. The purpose of this study was to analyze the differences in salivary cytokine profiles between JUUL (a type of e-cig) and non-JUUL using college students. Methods: A descriptive comparative study using quota sampling was conducted in 2019. Cytokine levels were compared between nonsmokers and JUUL-using college students. Data was collected via iPads at on-campus meetings within a 30 day period, and included demographics and tobacco use behaviors. JUUL use was defined as past 30 day use. Salivary samples were collected using a validated passive drool method. Cytokines analyzed included IFN γ , Interleukin (IL) 1 β , 2, 4, 6, 8, 10, 12, TNF- α , and cotinine. Data analysis included Spearman's correlation, Mann-Whitney U, and chi square tests (alpha of 0.05) using SAS, version 9.4. Results: Sixty-three students (30 males, 33 females), ages 18-24, completed the study. Seventy percent of lower undergraduates (freshmen, sophomores) compared to 30% of upper undergraduate (juniors, seniors) reported using a JUUL in the past 30 days. There were no differences in gender or race/ethnicity by JUUL use. JUUL users had significantly higher median levels (measured in pg/mL) of IFN γ (7.5 vs. 3.86, $p=.007$); IL-2 (1.93 vs. 1.08, $p=.002$); and TNF- α (9.17 vs. 6.99, $p=.05$); and lower levels of IL-4 (0.08 vs 0.17, $p=.015$). Further, IL-12 was marginally lower in JUUL-users (0.41 vs. 0.65, $p=.06$). JUUL-using students also had significantly higher levels of cotinine (78 ng/mL vs 0.9 ng/mL). Conclusions: Despite perceptions that e-cigs are a safe alternative to conventional cigarettes, e-cigs may alter the cytokine levels by creating a heightened pro-inflammatory and reduced anti-inflammatory milieu, potentially leading to a dysregulation in immune health.

FUNDING: Academic Institution

PS3-108

EXPLORING POSITIVE EXPECTANCIES AND QUIT STATUS AMONG ADULT E-CIGARETTE USERS

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Significance: Electronic cigarette (e-cigarette) use has risen substantially among adults in the United States. Recent work has identified e-cigarette users who attempt to quit but fail and those who never initiate a quit attempt as distinct groups who experience differing e-cigarette use, beliefs related to e-cigarettes, and challenges to e-cigarette cessation. One possible theoretical explanation for the differences between e-cigarette quit attempters and non-attempters may be the increased positive outcome expectancies endorsed by those who have attempted to quit e-cigarettes. To date, no work has evaluated how e-cigarette cessation attempt history may uniquely impact the effect of e-cigarette positive outcomes expectancies on clinically relevant e-cigarette processes. Thus, the current study examined the association between positive expectancies of e-cigarette use and perceived risks and benefits of e-cigarette use or perceived barriers to cessation across current, adult e-cigarette users who had and had not attempted to quit e-cigarettes. **Methods:** The present study included 544 adult e-cigarette users (51.1% female, $M_{age} = 35.4$ years, $SD = 10.12$). **Results:** Greater positive outcome expectancies of e-cigarette use was significantly related to increased perceived risks of e-cigarette ($b = .55$, $SE = .04$, $t = 12.75$, $p < .001$), perceived benefits of e-cigarette ($b = .69$, $SE = .04$, $t = 15.90$, $p < .001$), and perceived barriers to quitting e-cigarettes ($b = 4.08$, $SE = .55$, $t = 7.38$, $p < .001$). The strength of the associations was stronger for those who reported a past quit attempt relative to those who never attempted to quit e-cigarettes. **Conclusions:** The current study highlights the important role that positive expectancies for e-cigarette use and e-cigarette quit attempt status play in e-cigarette beliefs, e-cigarette use and cessation outcomes. These findings highlight the need to contextualize and target positive expectancies for e-cigarette use within future e-cigarette cessation tactics and tailor treatments based on quit attempt status.

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PS3-109

AN EXAMINATION OF JUUL USE AMONG COLLEGE STUDENTS

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Significance: Electronic Nicotine Delivery Systems (ENDS) use has dramatically increased in the emerging adult population (ages 18-25), with over one-third of undergraduate students reporting JUUL ever-use. Evidence linking ENDS use to adverse respiratory (cough) and psychosocial health (anxiety, depression), and subsequent marijuana use is increasing; yet product-level data is limited. The purpose of the study was to examine differences in nicotine dependence, psychosocial factors, and respiratory health between JUUL and non-JUUL using college students. **Methods:** In 2019, a comparative study using quota sampling was conducted among college students. All

data were collected via electronic survey administered at on-campus meetings within a 30 day period. JUUL use was defined as use in the past 30 days. Survey measures included nicotine dependence (Penn State Electronic Cigarette Dependence Index [PSECDI]), smoking behaviors, anxiety (Generalized Anxiety Disorder 7 [GAD-7]), depression (Patient Health Questionnaire-9 [PHQ-9]), respiratory health, and use of other illicit substances. Data analysis consisted of Mann-Whitney U, Chi Square (alpha $< .05$) using SAS, version 9.4. Results: Sixty-three students completed the study, 34 JUUL (16 male, 18 female) and 29 non-JUUL (14 male, 15 female) users. JUUL users were more likely than non-JUUL users to have smoked cigarettes (35% vs 10%; $p=.021$) and used marijuana (56% vs 17%; $p=.002$) in the past 30 days. When stratified by gender, a higher proportion of female JUUL users had smoked cigarettes (28%) or used marijuana (56%) compared to 0% of non-JUUL users. Compared to non-users, JUUL users were more likely to report recently having a cough that would not go away (24% vs 3%; $p=.031$), as well as higher anxiety ($p=.008$) and depression scores ($p=.007$). When stratified by gender, this association was not significant among males. There was no difference by PSECDI category of dependence or daily/non-daily use between males and females. Conclusions: JUUL use may present a significant risk to emerging adults with respect to multiproduct (cigarette and marijuana) use, development of a respiratory issues, anxiety and depression.

FUNDING: Academic Institution

PS3-110

REACH AND REPRESENTATIVENESS OF ELECTRONIC REFERRAL OF PRIMARY CARE PATIENTS TO AN EVIDENCE-BASED SMOKING TREATMENT

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Background: Effective smoking cessation treatments are underused and too rarely offered in primary care settings. Electronic referral via the electronic health record (EHR) may be an effective way to increase the reach of evidence-based smoking treatment

Objective: To compare the reach of faxed referral to a state tobacco quitline (FTQ) with electronic referral (eReferral) to intensive smoking reduction or cessation treatment, and evaluate the representativeness of eReferral reach across patient groups (gender, age, race, ethnicity, insurance) in primary care. **Methods:** Data are from a cluster-randomized trial in which adult primary care clinics in two integrated Midwestern healthcare systems implemented either FTQ (N=10 clinics, 6297 smokers) or eReferral to an intensive treatment offered in a research study (N=18 clinics, 33473 smokers). Chi-square analyses compared FTQ and eReferral treatment referral and enrollment rates among adult smokers and whether rates varied by patient characteristics and healthcare systems. **Results:** A significantly higher proportion of adults who smoke were eReferred to an intensive research treatment (7812/33473, 23.3%) than were faxed referred to a quitline (126/6297, 2.0%; Chi-square=1509.3, $p < .001$). A significantly higher proportion of those fax referred enrolled in treatment (57/126, 45.2%) than did those eReferred to intensive treatment (2257/7812, 28.9%, Chi-square=15.3, $p < .001$), but the reach of treatment (proportion of adults who smoked who engaged in treatment) was greater for eReferral (2257/33537, 6.7%) Vs. fax (57/6297, 1.2%, Chi-square=328.6, $p < .001$). eReferral rates differed by healthcare system, gender, race, ethnicity, age, and insurance, with elevated eReferral rates among women, African American, non-Hispanic, middle-aged, and Medicaid and uninsured patients **Conclusions:** EHR-based eReferral to intense smoking treatment had better reach than did fax referral to a quitline, and had relatively greater reach among groups at elevated risk for difficulty quitting, such as women, African American, and Medicaid-eligible or uninsured people who smoke.

FUNDING: Federal

PS3-111

A QUALITATIVE STUDY OF CANCER PATIENT'S ELECTRONIC CIGARETTE USE: SECONDARY ANALYSIS OF PATIENTS ENROLLED IN A SMOKING CESSATION TRIAL

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Background: Many cancer patients report using electronic cigarettes (e-cigs), but little is known about their beliefs and reasons for use. Several prior studies report that cancer patients may use e-cigs to quit smoking. We conducted a qualitative study to understand attitudes about e-cig use within the context of cancer care. **Methods:**



From 11/2013 - 7/2017, 303 adult smokers newly diagnosed with cancer enrolled in a smoking cessation trial. Patients randomized to Intensive Treatment received choice of FDA-approved cessation medicine at no cost and extended cessation counseling whereas patients randomized to Standard Treatment received brief counseling and cessation medication advice. At the end of the study, in-depth semi-structured interviews were conducted with a subset of participants using a priori stratification criteria, audio-recorded, and transcribed. Three study staff independently coded interviews using NVivo 11, achieving high inter-coder agreement ($Kappa = >0.86$). Results: Out of 303 trial participants, 72 interviews were conducted. Interviewees were on average 60 years old and 56% female. 51% reported current smoking, 50% reported ever e-cig use and 6% reported past-30 day e-cig use. Recurrent e-cig reasons for use themes included to quit or cut down on smoking and as a "healthier" alternative to cigarettes. Recurrent themes related to reasons for not using e-cigs included safety concerns (e.g., no FDA approval), and perceived health risks (e.g., e-cigs equivalent to cigarettes). Most patients began using e-cigs prior to their cancer diagnosis and few patients were using e-cigs in combination with NRT. Few patients had spoken with their clinician about e-cigs; many of those who did reported their clinician did not support use due to perception of harms such as vapor containing unknown chemicals. Conclusions: Some cancer patients use e-cigs to quit smoking however they also have concerns about the safety and risks. These findings suggest that oncology care clinicians should discuss the known and unknown risks and benefits of e-cigs with regard to quitting smoking in the context of cancer care.

FUNDING: Federal

PS3-112

ACTUAL VERSUS HYPOTHETICAL REASONS FOR JUUL USE

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Significance: Electronic cigarettes (ECs) have continued to grow in popularity and variety, with a relatively recent device, JUUL, capturing the majority share of the EC market. The current study sought to examine hypothetical versus actual reasons for JUUL use among young adults including whether reasons differed by gender and EC dependence. **Methods:** Young adults ($N = 947$) who were current or never JUUL users completed a questionnaire as part of an online intervention. Baseline data are presented. Items assessed hypothetical (never users) and actual (current users) reasons for JUUL use and tobacco product use history. Reasons for use were assessed using 15-items rated for the extent to which each reason might motivate (never users) or did motivate (current users) their initiation of JUUL. **Results:** Among current users ($n = 593$), the most common reasons for use were flavor options, lack of unpleasant smell, and curiosity. Interestingly, the most common hypothetical reasons for JUUL use among never users ($n = 354$) were similar, with curiosity being the top reason followed by lack of unpleasant smell and flavor options. Across reasons for use, current users rated given reasons as more important for motivating use than never users ($p < .01$). Differences in actual reasons for use between males and females emerged for curiosity ($p = .01$) and lack of unpleasant smell ($p < .01$), with males more motivated by curiosity and females more motivated by lack of unpleasant smell. There were no differences by gender for hypothetical reasons for use. Several reasons for use predicted EC dependence, including that JUUL helps with cravings ($\beta = 0.26$), affordability ($\beta = -0.12$), lack of unpleasant smell ($\beta = -0.18$), and ability to use where smoking is prohibited ($\beta = 0.15$; all $ps < .01$). **Conclusions:** Though current and never JUUL users rated similar hypothetical/actual reasons for JUUL use as most important, current users consistently rated given reasons as more important for motivating use. Motivations for using JUUL likely differ by gender and level of dependence, with factors related to convenience of use and craving management more important to those who are more dependent.

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PS3-113

LONGITUDINAL ELECTRONIC CIGARETTE USE AMONG PATIENTS NEWLY DIAGNOSED WITH CANCER ENROLLED IN A SMOKING CESSATION TRIAL

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Significance: Many patients diagnosed with cancer report previous or current electronic cigarette (e-cigarette) use, but little is known about e-cigarette use and cigarette cessation behaviors in this population. Using longitudinal data from a multi-site randomized

controlled trial of cancer patients who smoke, we aimed to (1) describe e-cigarette use patterns over 6 months and (2) assess smoking cessation outcomes among e-cigarette users. **Methods:** Data were from a trial of standard (brief counseling, ST) vs intensive treatment (sustained counseling plus smoking cessation medication, IT) in smokers newly diagnosed with cancer (within 3 months or 4 visits to the cancer center) recruited from 2 academic medical centers. Participants ($n=303$) were asked about e-cigarette use at baseline, 3 months, and 6 months. Biochemically confirmed past-7 day cigarette abstinence was collected at 6 months. **Results:** Prevalence of past-30 day e-cigarette use was 19% at baseline ($n=56/302$). Past-7 day e-cigarette use prevalence was 10% at 3 months ($n=21/212$) and 11% at 6 months ($n=23/215$). 7% of participants reported initiating e-cigarette use after baseline. Compared to participants in the IT arm, participants in the ST arm had higher prevalence of any e-cigarette use during the study (34% vs 18%, $p=0.01$) and higher rates of e-cigarette initiation after baseline (16% vs 4%, $p=0.01$). 39% of participants reporting current e-cigarette use at baseline were still using e-cigarettes at 6 months. Fewer participants who used e-cigarettes during the study were cigarette abstinent at 6 months compared to patients reporting no e-cigarette use, but this was not statistically significant (28% vs 39%; $p=0.16$). Participants who initiated e-cigarette use during the study had lower cigarette abstinence than participants who did not (13% vs 39%, $p=0.04$). There was no difference in self-reported evidence-based smoking cessation medication use between participants who did and did not use e-cigarettes. **Conclusion:** Some smokers newly diagnosed with cancer are using e-cigarettes, and over a third of smokers using e-cigarettes upon entry into a clinical trial were still using e-cigarettes 6 months later. Smokers offered intensive cessation support were less likely to initiate e-cigarette use. E-cigarette use during the trial was not associated with smoking cessation medication use or smoking abstinence. Providers should assess for e-cigarette use in cancer patients receiving smoking cessation treatment and promote use of evidence-based methods to quit.

FUNDING: Federal

PS3-114

PROGRAM COORDINATOR

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Introduction: The integration of bedside tobacco dependence treatment (TDT) into routine hospital care offers an opportunity to increase sustained recoveries and reduce hospital readmissions due to tobacco related illnesses. **Objective:** To assess the feasibility and preliminary outcomes of in hospital opt-out TDT with 6 months post-discharge follow-up care. **Methods:** Hackensack University Medical Center began offering TDT consistent with Joint Commission's tobacco use standards of care, in March 2019. Patient enrollment was initiated through documentation of tobacco use in electronic health records (EHR). Bedside counseling in English or Spanish, Nicotine Replacement Therapy (NRT) and text messaging support were offered at no cost, to patients agreeing to participate. Cessation outcomes were CO-verified 7-day point prevalence abstinence at 12 weeks. Client enrollment data as well as TDT services were analyzed using descriptive statistical methods. **Results:** Between March and August 2019, 2022 in hospital smokers were identified. Of these patients, 1860 (91%) were found in hospital admissions reports such as business information lists and patient EHRs. Health providers, nurses and physicians, referred 89 admitted patients and 73 patients self-referred through phone and email messages. A team of 3 counselors contacted 1468 (72%) patients in person or by phone. Brief initial counseling was provided for 391 patients (21%). Baseline visits were completed for 145 patients with 74% receiving NRTs and 86% enrolled for text messaging support. 4-week follow-up visits were completed by 40 patients resulting in a retention rate of 32%. A retention rate of 15% was achieved at 12 weeks, with 8 participants completing follow-up visits and 9% biochemically verified abstinent using intent to treat analysis. **Conclusions:** Results indicate that integrating tobacco treatment services, as an opt-out model of hospital care is feasible. Further data is needed to establish significant levels of maintained tobacco recoveries through post-discharge follow-up care. Future program opportunities include the need to create mandatory protocols for routine patient tobacco use status updates with EHR auto-referrals for TDT.

FUNDING: State



PS3-115

RELATIONSHIP BETWEEN FAMILY HISTORY OF SMOKING-RELATED DISEASES AND RISK PERCEPTIONS AMONG YOUNG ADULT E-CIGARETTE USERS

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Significance: Tobacco smoke exposure has been linked to several chronic health conditions, and evidence suggests that family history of smoking-related diseases may promote elevated risk perceptions for cigarettes. However, little is known about the extent to which family history of smoking-related diseases may predict perceived risk of using other nicotine/tobacco products, particularly those with uncertain risks profiles (e.g., e-cigarettes). This study examined whether family history of smoking-related disease predicted risk perceptions for e-cigarettes among young adults endorsing minimal history of tobacco use. **Methods:** A sample of 124 participants (M=19.5 years old, 49.2% male, 73.4% Caucasian) who reported using e-cigarettes at least monthly for the past six months were recruited online and completed quarterly assessments for 21 months. Participants reported family histories of various smoking-related diseases and other cancers and were classified as having a family history of smoking-related disease (SD; i.e., lung cancer, head or neck cancer, heart disease, or chronic lung disease), a family history of other cancers but not smoking related disease (OC), or no family history (NFH). Additional items assessed risk perceptions for e-cigarettes in the context of general health issues as well as specific smoking-related diseases (i.e., cancer, respiratory disease, or cardiovascular disease). **Results:** Longitudinal regression analyses indicated that, when compared to the NFH group, participants in the OC group perceived e-cigarettes as less likely to cause respiratory disease ($p=0.004$) and cancer ($p=0.003$). SD participants perceived e-cigarettes as more likely to cause cancer ($p=0.033$) and generally more harmful ($p=0.003$) than did those in the NFH group. **Conclusion:** These findings indicate that family history of smoking-related diseases may influence risk perceptions of e-cigarette users. More specifically, having a family history of smoking-related disease may lead young adults to generalize their concerns about cigarettes to e-cigarettes, whereas those with family histories of other cancers may be more likely to view e-cigarettes as a safer alternative.

FUNDING: Federal

PS3-116

EXAMINING THE EFFECTS OF STRESS AND EMOTIONAL DISTRESS ON SMOKING CESSATION OUTCOMES IN CANCER PATIENTS ENROLLED IN A CESSATION TRIAL

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SIGNIFICANCE: Cancer patients who smoke report more stress and distress than cancer patients who do not smoke. Stress is the perception that environmental demands exceed coping resources. Distress is emotional suffering and experiences that follow stress including anxiety. Both are associated with worse smoking outcomes in other populations, but little research has examined the role of these factors on smoking behavior in cancer patients. We aimed to examine the influence of a cessation intervention on stress and distress and to determine the effects of changes in these symptoms on confirmed abstinence in cancer patients. **METHODS:** Secondary analysis of data from the Smokefree Support Study, a two-site randomized controlled trial examining the efficacy of Intensive (IT; $n=153$) vs. Standard Treatment (ST; $n=150$) for smoking cessation in newly diagnosed cancer patients. All patients received 4 weeks of counseling and pharmacotherapy recommendations. IT patients received 7 additional counseling sessions and pharmacotherapy at no cost. Stress, distress, and anxiety were self-reported at baseline 3, and 6 mo using the PSS-4, 1-item NCCN thermometer, and GAD-7, respectively. Abstinence was biochemically confirmed at 6 mo. **RESULTS:** At baseline, patients were on average, 58 years old, 56% female, smoked a mean of 14 cigs/day. While there were no significant treatment group x time interactions or main effects of treatment group on stress, distress or anxiety ($p>.05$), there were significant main effects of time suggesting significant decreases (i.e., symptom improvements) over time for each measure ($p<.05$). In logistic regression models controlling for treatment group, decreases in anxiety (OR: 1.11, CI:0.86-0.96) and stress (OR:1.14, CI:0.79-0.97) across the 6-mo study, but not decreases in distress (OR:1.05, CI:0.87-1.03), predicted confirmed abstinence at 6 mo. **CONCLUSIONS:** Consistent with the general population,

stress and anxiety impact quit smoking outcomes and are important targets in cancer patients who smoke. Future work should consider enhancing the psychological support provided to cancer patients attempting to quit smoking.

FUNDING: Federal

PS3-117

EVALUATING NICOTINE DEPENDENCE AND PATTERNS OF USE IN EXCLUSIVE USERS OF TOBACCO PRODUCTS USING A POTENTIAL COTININE LEVEL THRESHOLD

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Significance: The FDA has sought comments on a potential product standard to lower nicotine in combusted cigarettes to a non-addictive level, based on observations that exclusive cigarette users who smoke less than or equal to 5 cigarettes per day, equivalent to approximately 0.3-0.5 mg/g nicotine or 50-70 ng/mL serum cotinine, often appear to be non-dependent. In today's landscape, it is unclear how multiple product types and methods of nicotine delivery affect nicotine exposure and dependence in exclusive users of tobacco products. **Methods:** This cross-sectional analysis used Population Assessment of Tobacco and Health (PATH) Study Wave 1 data to assess if current adult exclusive users of tobacco products who fall above and equal to or below 70 ng/mL serum cotinine display differential use patterns and nicotine dependence. Univariate linear regression analysis was used to examine the relationship between outcomes of product use frequency, quantity, and Tobacco Dependence (TD) in participants who provided blood samples in the four largest groups of exclusive tobacco product use: cigarettes, ENDS, cigars, and smokeless tobacco (ST). Outcomes were compared between the user groups in those with less than or equal to 70 ng/mL serum cotinine (below group, BG), and those with greater than 70 ng/mL serum cotinine (above group, AG). Outcomes were also compared within each user group between AG and BG participants. **Results:** All BG user groups reported less TD than their AG counterparts; significant for exclusive cigarette, cigar, and ST users (p less than .0001 for each comparison). All BG groups reported less frequency of use than their AG counterparts (p less than .0001 for each comparison). All BG groups reported lower quantity of use than their AG counterparts (p less than .05 for each comparison). **Conclusion:** Differences exist in tobacco dependence, frequency, and quantity of use between users with greater than and less than or equal to 70 ng/mL serum cotinine for most exclusive tobacco product users.

FUNDING: Federal

PS3-118

UNDERSTANDING THE INFLUENCE OF INITIAL E-CIGARETTE USE MOTIVATION ON COMBUSTIBLE AND E-CIGARETTES AMONG SUSTAINED DUAL USERS

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Significance: Many smokers report using e-cigarettes to quit smoking. It is unclear whether this initial motivation influences product use patterns over time. **Methods:** Dual users (defined by smoking daily for 3 months and using e-cigarettes at least once/week for the past month) who at study baseline were not interested in quitting either product, were recruited to participate in a two-year longitudinal observational study. Participants recorded daily use of combustible and e-cigarettes over two weeks at four-month intervals using a smartphone application. Analyses explore use patterns at baseline and 12 months comparing participants who endorsed a baseline belief that e-cigarettes help with smoking cessation and those who did not endorse that belief. EMA data are from participants reporting at least one baseline vaping episode. **Results:** Compared with dual users who did not see e-cigarettes as an aid to cessation ($n=70$), those with that belief ($n=101$) showed baseline differences of: higher mean baseline vapes per day, fewer combustible cigarettes per day, and higher baseline e-cigarette primary dependence (via the Wisconsin Inventory of Smoking Dependence Motives: e-cigarette version). The same trend was seen for mean vapes per day and mean cigarettes per day at 1-year post-enrollment. The two groups also showed different time of day and day of the week use patterns at baseline and at 1-year post-enrollment. The descriptive trends of change in smoking status between the two groups at 12 months post-enrollment were distinguishable but not statistically significant. **Conclusions:** Belief in e-cigarettes as a smoking cessation tool is related to real-world use patterns even among dual users



who are no longer interested in quitting smoking. These patterns may help guide future research to understand how this motivation drives long-term product use and whether it effectively leads to reduction or abstinence of tobacco products.

FUNDING: Federal

PS3-119

EXPOSURE TO JUUL USE GENERALIZES AS A CUE TO INCREASE OBSERVERS' DESIRE FOR CIGARETTES AND E-CIGARETTES

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Significance: There is growing evidence that electronic nicotine delivery systems (ENDS) exposure significantly increases young adult smokers' desire for cigarettes and ENDS (King et al., 2015, 2016, 2018; Vena et al., 2019). We examined whether passive exposure to the JUUL, a novel "pod mod" ENDS device, would elicit desire for cigarettes and ENDS in young adult current and former smokers.

Methods: In a controlled laboratory paradigm, participants engaged in conversation with a study confederate who first drank a bottle of water (control cue) and then used a JUUL (active cue). Following the cue exposure phase, current smokers participated in a smoking latency phase to examine smoking behavior. **Results:** The sample included N=62 young adult current smokers (age 27.8 yrs; 50% female; 10.3±6 cig/day; 79% past ENDS use, none daily users) and 20 former smokers (M=362 days smoke-free with similar demographic and past smoking behavior to the current smokers). Results showed that the JUUL cue elicited a greater increase in cigarette desire (time*group, Wald $\chi^2(2)=6.99$, $p=0.030$) among current vs former smokers. The JUUL cue also elicited desire for a JUUL (time, Wald $\chi^2(2)=9.80$, $p=0.007$) and desire for a mod/vape pen (time, Wald $\chi^2(2)=11.7$, $p=0.003$), with current and former smokers showing similar responses (group, $ps>0.05$). During the latency task, 65% of current smokers chose to smoke which is similar to previously examined ENDS/com-bustible cues [median latency=25.2 min]. Negative affect decreased during the session for both groups with a sustained decrease in current, but not former smokers ($p<0.05$). **Conclusion:** In sum, passive exposure to a JUUL elicits desire for cigarettes in current smokers and also desire to vape in both current and former smokers. Assessment of mood response indicates that changes in desire are attributed to the JUUL and not negative affect. Collectively, these findings suggest that exposure to the JUUL can act as a smoking cue for current smokers and re-normalize tobacco use in former smokers. As more pod mods emerge, an extensive understanding of the effects of passive exposure, on both current and former smokers, will become increasingly important.

FUNDING: Federal

PS3-120

PREDICTORS OF PRIMARY CARE PROVIDER PROMOTION OF SMOKING CESSATION AMONG SMOKERS WITH SERIOUS MENTAL ILLNESS

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Significance: Prevalence of nicotine addiction is elevated in those with serious mental illness (SMI), estimated at 43%-79% among those with schizophrenia spectrum, bipolar, and major depressive disorders. Practice guidelines recommend advice to quit, prescription of smoking cessation medication, and referral to behavioral treatment for all smokers at every clinical visit. Despite evidence that most smokers with SMI want to quit smoking and that first-line medications are effective and well-tolerated in this group, little is known about provision of smoking cessation treatment to this group. **Methods:** All smokers with SMI receiving psychiatric rehabilitation services from the two largest human services agencies in Greater Boston were eligible and invited to enroll in a three-year system level intervention to increase provision of smoking cessation treatment to those with SMI in primary care settings. Participants completed a brief annual survey about their smoking behavior and receipt of cessation treatment in the last year. Expired carbon monoxide (CO) was also measured. Multivariate models identified predictors of physician recommendation to quit smoking and prescription of medication. **Results:** 1,166 smokers with SMI enrolled. The majority (66%) reported smoking 5-20 cigarettes/mini-cigs per day. Most (92%) reported that their PCP was aware they smoked tobacco products. Although 70% reported their PCP recommended cessation, only 36% reported their PCP prescribed a cessation aid. Among all smokers, the most common medication prescribed was nicotine patch (26%), followed by nicotine gum/lozenge (19%), varenicline

(6%) and bupropion (1%). Expired CO ≥ 10 and smoking-related illness were positively associated with both physician recommendation to quit and prescription of medication.

Conclusions: In this primary care population of moderate to heavy smokers with SMI, nearly two thirds received no prescription for smoking cessation medication in the past year. Increasing provision of evidence-based care for smokers with SMI would reduce smoking prevalence and the mortality gap associated with high prevalence of cardiovascular and pulmonary disease in people with SMI.

FUNDING: Nonprofit grant funding entity

PS3-121

E-CIGARETTE USE AMONG PEOPLE WITH MENTAL HEALTH & SUBSTANCE USE PROBLEMS

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Significance: Smoking has a negative impact on health and treatment outcomes in people with a mental health and/or substance use disorder (SUD) and contributes to their shorter life span. In the UK, e-cigarettes are the most popular and effective quitting aid among smokers. Research on prevalence, characteristics of use of e-cigarettes and risk perceptions among people with a mental health and/or SUD is lacking.

Methods: In 2018, we conducted a cross-sectional survey with a convenience sample of clients and staff from mental health and addiction services in a NHS organisation in London, England. The organisation has 4 mental health hospitals and over 100 community teams. The hospitals are smokefree but allow the use of e-cigarettes as part of the tobacco dependence treatment pathway. **Results:** 185 clients and 175 staff completed the survey. Most clients were from mental health services (55.1%, $n=102$) with (44.9%, $n=83$) from addiction services: 76% ($n=133$) of staff were from mental health services, with 24% ($n=42$) from addiction services. Smoking prevalence was higher in clients (66.3%) and staff (21%) from addiction services compared with mental health clients (31%) and staff (4.5%). Whereas vaping prevalence was higher in mental health clients (14.5%) than those from addiction services (4.8%): 21% of staff working in addiction services were current vapers compared with 6.8% of mental health staff. More mental health than addictions clients were daily vapers ($\chi^2(2) = 6.84$, $p=.009$) and more clients than staff were daily vapers ($\chi^2(2) = 6.38$, $p=.012$). Across all clients and staff, the most common reason for using e-cigarettes was to quit smoking. Use of e-liquid flavours did not differ between staff and patients, but clients used higher nicotine strengths than staff. There were significant differences between staff and client's risk perceptions; 86.5% of staff believed that e-cigarettes were less harmful for a smoker's health than tobacco cigarettes compared with 53% of clients. 81.7% of staff believed that e-cigarette vapour is less harmful to a bystanders health than tobacco smoke, compared with 53% of clients. **Conclusion:** Among clients in addiction services, smoking prevalence was higher but vaping prevalence lower than in mental health clients. Whereas both smoking and vaping prevalence were higher in addictions than mental health staff. Characteristics of use were mostly similar across all groups. Given the high prevalence of smoking among clients in addiction services, more could be done to improve the uptake of e-cigarettes in this group.

FUNDING: State

PS3-122

COMPARISON OF DEMAND FOR CIGARETTES AND METHAMPHETAMINE AMONG INDIVIDUALS WITH METHAMPHETAMINE USE DISORDER

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Cigarette smoking is highly prevalent among populations that use psychomotor stimulants, with some of the highest reported rates (87 to 92%) among individuals with methamphetamine (MA) use disorder. However, relatively little research has examined the abuse liability of cigarettes vs. MA among individuals with MA use disorder in comparison to other psychomotor stimulants such as cocaine. The current study examined demand for MA and cigarettes. Drug demand is a behavioral economic measure that assesses how much drug an individual will consume as a function of increasing price. Drug demand has been useful for measuring various drug-related constructs such as drug valuation, motivation to use drugs, and drug abuse liability. Participants consisted of non-treatment seeking volunteers with MA use disorder ($N = 18$) of which 17 reported cigarette smoking. Each participant completed hypothetical purchasing tasks for cigarettes and MA. Results showed that an exponentiated model of demand provided



a good fit to consumption data for cigarettes ($r^2 = 0.94$) and MA ($r^2 = 0.89$). Bayesian generalized linear modeling (GLM) found evidence that several demand characteristics were related to self-reported measures of drug use severity (cigarettes/day, days MA used in the past 30) for cigarettes (Q_0 , α , P_{max} , break point) and MA (Q_0 , O_{max} , P_{max} , break point). Comparison of normalized demand curves for cigarettes and MA revealed higher abuse liability for MA compared to cigarettes. The current results support the utility of drug demand assessments for cigarettes and MA among individuals with MA use disorder. These findings lay down the foundation for future studies to assess the impact of treatment cigarette smoking and MA use individually or together in this population.

FUNDING: Federal

PS3-123

DIFFERENTIAL PATTERNS OF BRAIN RESPONSE TO PROXIMAL AND CONTEXTUAL SMOKING CUES PREDICTS RELAPSE DURING A QUIT ATTEMPT

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Significance: Smoking cues evoke craving and increase activation in brain regions involved in reward, salience, interoception, and cognition. Greater activation to smoking cues in regions such as anterior and posterior cingulate cortex (ACC and PCC) has been shown to predict relapse. However, as most studies have focused on proximal smoking cues (e.g., image of lit cigarette), less is known about broader contextual associations in the physical environment that may elicit distinct neural activation patterns and contribute to relapse. **Methods:** Smokers ($n=30$) completed a previously validated fMRI task in which they viewed blocks of smoking vs neutral images from 3 different stimulus categories: proximal cues, standard environments, and personal environments. They then initiated a 10-wk quit attempt supported by transdermal nicotine. Relapse was defined as smoking ≥ 5 cigarettes per day for 3 consecutive days. Whole-brain comparisons of relapsers ($n=20$) vs abstainers ($n=10$) were conducted using FSL, cluster-corrected to $P < 0.05$. Additional analyses focused on signal extracted from *a priori* regions of interest (ROIs) implicated in context-induced drug seeking including hippocampus (HPC), amygdala, and anterior insula. **Results:** Across the whole brain, relapsers had greater activation to proximal smoking vs neutral cues in reward and self-referential processing regions including medial prefrontal cortex, PCC and nucleus accumbens. Abstainers had greater activation in cognitive/motor control regions including mid-cingulate, putamen, thalamus, and right inferior frontal gyrus. Within ROIs, relapsers relative to abstainers had greater activation to personal contextual smoking vs neutral cues ($p < .05$), but reduced activation to proximal smoking vs neutral cues ($p < .01$), in the left amygdala, with a similar trend in bilateral HPC. **Conclusions:** In the context of exposure to a variety of smoking-related stimuli, reduced engagement of reward and self-referential regions, along with greater engagement of cognitive control regions in response to proximal smoking cues is associated with ability to abstain from smoking. Moreover, these results support the role of the HPC and amygdala in drug-context associations and suggest that these regions may be important targets for future research to improve cessation outcomes.

FUNDING: Federal

PS3-124

DIFFERENCES IN TRANSDIAGNOSTIC PSYCHOPATHOLOGY AMONG NON-TREATMENT SEEKING AFRICAN AMERICAN MENTHOL AND NON-MENTHOL CIGARETTE SMOKERS

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Acknowledgement: Tobacco Centers of Regulatory Science award U54CA180908 from the National Cancer Institute **Background:** Prior work has shown that menthol cigarettes are harder to quit and easier to smoke. Menthol cigarette use is prevalent among disadvantaged populations, such as smokers with transdiagnostic emotional psychopathology and African American (AA) smokers. The scarce amount of literature exploring the intersectionality of these two populations has made it unclear whether the prevalence of menthol cigarette use is higher among racial/ethnic minority populations with transdiagnostic psychopathology. The current study examined the differences in psychopathological traits between AA menthol and non-menthol smokers. It is hypothesized that non-menthol smokers will show lower scores of trait psychopathology compared to menthol smokers. **Methods:** Self-report questionnaires assessing psychopathology (i.e., psychomotor agitation, impulsiveness, depressive symptoms, anxiety sensitivity,

and obsessive compulsive symptomatology) and smoking behavior (e.g. mentholated vs. non-mentholated preference) were administered during a baseline session to 791 AA cigarette smokers (menthol smokers = 62%; $M [SD]$ age = 49.9 [10.7]). Independent samples t-tests were conducted to examine whether there were significant differences in psychopathology among AA menthol and non-menthol smokers. **Results:** Results demonstrated significantly greater levels of transdiagnostic emotional psychopathology among AA menthol smokers relative to non-menthol smokers, particularly related to depressive (i.e., appetite loss, psychomotor agitation, and ill-temperament; $ps = .001, .001, .001$) and anxiety symptomatology (i.e., panic and trauma; $ps = .004, .023$), and obsessive compulsive symptomatology (i.e., obsessing, hoarding, checking, and neutralizing behaviors; $ps = .03, .01, .01, <.001$). No significant differences were found for impulsivity, dysphoria, lassitude, and anxiety sensitivity. **Conclusions:** Findings demonstrated higher levels of transdiagnostic emotional psychopathology among AA menthol (vs. non-menthol) smokers, but not for all symptoms. Understanding between group differences in prevalence of trait psychopathology is key to improving treatment outcomes for this sub-population and for guiding federal policy on regulating menthol cigarette sales. This vulnerable sub-population may have more difficulties quitting smoking future work is needed to better understand menthol related smoking behaviors.

FUNDING: Federal

PS3-125

COMPARISON OF LIQUID CHROMATOGRAPHY MASS SPECTROMETRY AND ENZYME-LINKED IMMUNOSORBENT ASSAY METHODS TO MEASURE SALIVARY COTININE LEVELS IN ILL CHILDREN

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Background: The preferred biomarker for assessing tobacco smoke exposure (TSE) is cotinine. Compared to enzyme-linked immunosorbent assay methods (ELISA), liquid chromatography-tandem mass spectrometry (LC-MS/MS) is superior at measuring very low TSE levels with excellent sensitivity and specificity, but due to cost, ELISA is often used. **Objective:** To compare ELISA and LC-MS/MS methods of salivary cotinine detection in children 0-17 years of age. **Methods:** Participants were parental smokers and children ($N=204$; mean age(SD)=6.1(5.1) years) presenting to the emergency department. Saliva was obtained on all children at baseline and from 15 children 6-weeks after the index visit. These 219 samples were analyzed for cotinine by ELISA and LC-MS/MS. The level of quantitation (LOQ) was 0.1 ng/ml for the LC-MS/MS assay and 0.15 ng/ml for the ELISA assay. Intraclass correlations (ICCs) were used to examine the internal consistency of the cotinine measures. Linear regression models were used to compare cotinine measures to each other and to examine their relationship with child's age, race/ethnicity, and sex; and parent's income, smoking patterns, and home type. **Results:** The ICC of the final cotinine measurements across methods was 0.884 and was equivalent in subgroups of sex and age. The ICCs of cotinine measurements from replicates within each method were 0.993 and 0.996 for ELISA and LC-MS/MS, respectively. The geometric mean(GeoM) for the LC-MS/MS assay was 4.0; median(Mdn)=4.2 ng/ml; interquartile range(IQR):1.3-10.3ng/mL; 3% of samples<LOQ. The GeoM for the ELISA assay was 5.6; median(Mdn)=5.1 ng/ml; IQR: 2.1-13.0ng/mL; 5% of samples<LOQ. Similar associations of cotinine concentrations with age ($B^{\wedge} < 0.10, p < 0.0001$), number of cigarettes smoked ($B^{\wedge} > 0.07, p < 0.0001$), and demographics were found regardless of the method; however, cotinine associations with sex and race/ethnicity were only significant in models using LC-MS/MS-derived cotinine which showed cotinine was lower in females and higher in non-Hispanic Blacks than non-Hispanic Whites. **Conclusion:** The cotinine measurements derived from ELISA and LC-MS/MS were largely in agreement, with an increase in sensitivity in the LC-MS/MS assay. Higher mean cotinine based on ELISA is likely the result of cross-reactivity with 3HC. However, associations of cotinine with sex and race/ethnicity were detected only when cotinine was quantified by LC-MS/MS, demonstrating the benefits of utilizing the more sensitive LC-MS/MS assay for cotinine measurement in children when detecting TSE.

FUNDING: Federal; Academic Institution



PS3-126

CHARACTERISTICS OF CIGARETTE AND E-CIGARETTE DUAL USE SUBTYPES CREATED WITH FINITE MIXTURE MODELING

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Significance: Many tobacco cigarette smokers become dual users through the addition of electronic cigarettes (e-cigs). Dual users often report the initiation of vaping in order to quit smoking. It is important to examine the presence of subtypes that may be useful in predicting future smoking and vaping behavior, particularly smoking cessation. The aim of this study was to examine subtypes created by finite mixture modeling (FMM), a data-driven latent modeling technique. **Methods:** Analyses used self-report baseline data from an ongoing RCT evaluating a smoking cessation intervention for dual users. Participants (N=2,986 enrolled July, 2016, to June, 2017) smoked ≥ 1 cigarette/week over the past year and vaped ≥ 1 time/week over the past month. Surveys assessed demographics, smoking and vaping history, current smoking and vaping behavior and attitudes. Six variables were used for the FMM (Mplus 8.2). For smoking, these were cigarettes per day (CPD), days per week, and time to first cigarette after waking. Similar variables assessed vaping behavior. All other variables were compared to further characterize the subtypes. **Results:** The sample was 63% male and 83% non-Hispanic White; 38% had an annual income less than \$20K. Mean age was 29.9 years (SD=11.3). Smoking behavior varied greatly with 60% smoking daily, 42% smoking 11+ CPD, and 57% smoking ≤ 30 minutes of waking. Vaping behavior also varied greatly with 69% vaping daily, 62% with 20+ events per day, and 64% vaping ≤ 30 minutes. FMM produced 8 well-defined subtypes. Over half of the sample was classified into 2 subtypes: 31% smoked and vaped extensively; 27% vaped extensively and smoked relatively little. The smallest subtype (3%) consisted of those smoking and vaping relatively little. There were numerous significant differences among the subtypes in gender, age, time since becoming a dual user, smoking behavior prior to dual use, cravings to smoke, and self-efficacy for smoking cessation ($p < .006$). **Conclusion:** FMM effectively created well-defined dual use subtypes that differed across a variety of characteristics. Future research will examine differences in subsequent smoking and vaping.

FUNDING: Federal

PS3-127

PREDICTORS OF E-CIGARETTE QUIT ATTEMPTS AMONG ESTABLISHED E-CIGARETTE USERS

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Purpose: We sought to understand predictors of e-cigarette quit attempts among adult users of e-cigarettes. **Methods:** We used data from the Population Assessment of Tobacco and Health (PATH) Public Use Wave 2 and Wave 3 Adult Questionnaire. All-wave weights were applied to all longitudinal analyses. The initial sample consisted of 1692 adult current, established e-cigarette users who participated in Waves 1-3. Weighted percentage estimates are reported. Logistic regression analysis was used to model the association between Wave 2 mental health and e-cigarette related characteristics and e-cigarette quit attempts in the year preceding Wave 3. Adjusted odds ratios and 95% confidence intervals are reported. Listwise deletion was used to address missing data. **Results:** At Wave 2, participants were using e-cigarettes 19.89 days in the past month and scored 1.87 (out of 5) on an aggregate measure of e-cigarette dependence. In the year prior to Wave 3, 26.3% of e-cigarette users made an attempt to quit e-cigarettes, employing a variety of formal and informal cessation strategies. The likelihood of making an attempt to quit e-cigarettes was marginally associated with endorsing more symptoms of externalizing disorders (OR: 1.20; CI: 0.99, 1.46) and statistically significantly associated with reporting problematic use of at least one substance (OR: 1.80; CI: 1.16, 2.80). Higher e-cigarette dependence (OR: 1.32; CI: 1.08, 1.61) and higher interest in quitting e-cigarettes (OR: 1.22; CI: 1.15, 1.30) were also associated with increased likelihood of making an attempt to quit e-cigarettes. Frequency of e-cigarette use in the past month and e-cigarette flavor use were not reliable predictors of e-cigarette quit attempts. **Conclusion:** Preliminary analyses suggest that 26.3% of e-cigarette users are making attempts to quit e-cigarettes, and that several mental health, substance use, and e-cigarette related characteristics may be helpful in identifying which e-cigarette users may be more likely to make e-cigarette quit attempts.

FUNDING: Unfunded

PS3-128

THEORIZED INTERNAL CAPABILITIES AND ENVIRONMENTAL OPPORTUNITIES IMPACTING HOMELESS YOUTHS' ENGAGEMENT AND SUCCESS WITH EVIDENCE-INFORMED SMOKING CESSATION TREATMENT

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Background: 70% of homeless youth in the US smoke combustible tobacco. A majority of them have tried to quit, but most without supported cessation intervention—a public health oversight. We used the Capability-Opportunity-Motivation framework for contextually-focused behavior change (COM-B), from the Behaviour Change Wheel process for intervention development, to investigate the research question: What internal capabilities and social and physical environmental opportunities need to be in place for homeless youth smokers to be motivated to quit and engage supported tobacco cessation treatment? **Methods:** Recruited on age and motivation to quit in the next 30 days, homeless youth smokers from a Midwestern drop-in center completed qualitative interviews (n=36) based on COM-B framing. Each transcript was coded twice, and themes were identified by subgroup (14-17 year olds, 18-24 year olds motivated to quit, and 18-24 year olds not motivated to quit). For each subgroup, themes were captured in a COM-B model highlighting key internal capabilities and external opportunities to address in order for homeless youth to engage and find success with supported cessation treatment (Inter-rater reliability Krippendorff's $\alpha = .791$). **Results:** For all youth, internal capabilities to target for cessation include knowledge of evidence-based cessation methods, stress reactivity and resilience, and self-regulation through executive function strengthening. External opportunities include access to evidence-based tobacco treatment, support following a smoking lapse, structured social activities with non-smoking peers, and drop-in center tobacco-free policies. Other capabilities and opportunities by subgroup will be presented. **Conclusions:** Unique internal capabilities and external opportunities impacting homeless youths' access to and success with supported cessation intervention have been identified and will inform cessation development and optimization for the population.

FUNDING: Federal

PS3-129

COMORBID CHRONIC PAIN AND TOBACCO CIGARETTE SMOKING AMONG PEOPLE LIVING WITH HIV (PLWH)

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Over 35 million people are infected with HIV, and rates of pain and tobacco cigarette smoking are substantially higher among people living with HIV (PLWH) than in the general population. Despite evidence of pain-smoking comorbidity, no previous work has examined the prevalence and impact of co-occurring chronic pain and cigarette smoking among PLWH. We hypothesized that the prevalence of chronic pain would be higher among current smokers (vs. never and former smokers) and increase as a function of smoking rate, and that current smoking (vs. never smoking) would be associated with deleterious substance-related outcomes among PLWH with chronic pain. Participants included 3289 PLWH (83% male; 13.4% detectable viral load; mean CD4⁺ T-cell count = 585 cells/mm³) who were recruited from five HIV clinics. Approximately 33% of current smokers reported chronic pain, compared to 24% among former smokers ($p < .01$), and 17% among never smokers ($p < .01$). Among current smokers, the prevalence of chronic pain was 29% among those smoking < 10 CPD, 34% among those smoking 10-20 CPD, 43% among those smoking 20-40 CPD, and 67% among those smoking > 40 CPD ($\chi^2 = 9.96, p < .05$). After controlling for relevant sociodemographic and substance-related variables, current smokers (vs. never smokers) with chronic pain were twice as likely to endorse cannabis use, 5 times as likely to endorse cocaine use, and nearly 3 times as likely to endorse other past 3-month substance use ($ps < .05$). Smokers were also 1.5 times as likely to receive long-term opioid therapy ($ps < .05$). These results indicate that the prevalence of chronic pain is higher among PLWH who smoke cigarettes (vs. non-smokers), perhaps in a dose-dependent fashion, and that smoking may be associated with an increased risk for other substance use among PLWH with chronic pain. Pain can be a potent motivator of smoking and has been identified as a barrier to quitting smoking among PLWH. Patients may benefit from interventions that are tailored to address bidirectional pain-smoking effects in the context of HIV.



PS3-130

ASSOCIATION BETWEEN PRIMARY MODE OF MEDICAL CANNABIS CONSUMPTION AND SMOKING STATUS

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Purpose: To evaluate an association between primary mode of medical cannabis consumption and cigarette smoking or vaping status. **Methods:** Participants (N=610) were from a larger study examining medical cannabis use behavior and co-use of tobacco containing products among adults in New Jersey. The current sample included adults who reported a lifetime history of cigarette smoking or vaping and who purchased cannabis at a medical cannabis treatment center. A logistic regression analysis was used to model the association between mode of cannabis consumption (smoking/vaping) and cigarette smoking and vaping status, while controlling for age, sex and days of cannabis use prior to enrolling in the state medical cannabis program. **Results:** Participants (60.4% male) were 42.23(14.41) (Mean(Standard Deviation)) years old on average. Approximately 39% of participants were cigarette smokers and/or vapers: 15.4% were current, established cigarette smokers, 15.1% were current vapers, and 8.1% were current dual users of cigarettes and e-cigarettes. On average, participants reported using cannabis on 24.06(9.88) days in the past month and reported smoking cigarettes on 22.31(10.56) days in the past month. Smokers reported smoking 9.35(7.86) cigarettes per day, and vaping 8.17(18.59) times per day, on average. Over 75% of study participants reported that their primary mode of cannabis consumption was smoking, with 21.5% reporting vaping as their primary mode of consumption. Results suggest that smoking status is a significant predictor of primary mode of cannabis consumption, with smokers being 6.06 times more likely to report smoking as opposed to vaping cannabis, compared to non-smokers ($p=0.001$). **Conclusion:** While dispensary staff encourage patients to vape, rather than smoke, medical cannabis, the majority of patients did not follow this advice and this was highly influenced by cigarette smoking status. Present state medical cannabis policy, which permits cannabis flower for medical use and limits edible and alternative formulations to minors, may influence medical cannabis consumption and route of administration.

FUNDING: Unfunded

PS3-131

THE IMPACT OF SMOKING CIGARETTES WITH VERY LOW NICOTINE CONTENT CIGARETTES ON SMOKING AND WEIGHT-RELATED BEHAVIOR AMONG INDIVIDUALS WITH SUD

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Introduction: Cigarettes with low nicotine yield are associated with reduced carcinogen exposure and increased likelihood of smoking cessation. Some research has suggested that smokers randomized to low nicotine content cigarettes gain more weight over 6 weeks than those smoking their usual brand. The effects of smoking very low nicotine content (VLNC) cigarettes on appetite and weight are not yet known. The current study aimed to evaluate the impact of smoking VLNC cigarettes on appetite, food preference, and weight over 6 weeks relative to smoking cigarettes with normal nicotine content (NNC). **Methods:** Adult cigarette smokers ($n=118$) with Substance Use Disorders and motivation to quit smoking were recruited from the community to participate in a double-blind study. Participants were randomly assigned to receive research cigarettes either with NNC (a nicotine yield value of approximately .7 mg) or VLNC (a nicotine yield value of approximately .04 mg) for 6 weeks. Each week, average cigarettes per day, appetite and food preferences, and weight were assessed. Mixed ANOVA was used to assess changes in these variables as a function of condition and time (weeks 1-6). **Preliminary Results:** Over 6 weeks, individuals in the VLNC condition had a greater reduction in their number of cigarettes smoked daily than those in the NNC condition. However, there were no differences in appetite, preference for sweet foods, overeating at mealtimes, consuming larger portions, or snacking as a function of condition. Similarly, there was no effect of time, condition, nor an interactive effect of the two on weight over 6 weeks. **Conclusions:** Results suggests that individuals did not engage in compensatory eating behaviors when smoking VLNC cigarettes. They did not experience noticeable differences in their eating behavior and, accordingly, did not experience weight gain despite reductions in nicotine. This work further supports the promise of regulatory policies that lower the nicotine content in combusted tobacco products.

FUNDING: Federal; Nonprofit grant funding entity

PS3-132

PATTERNS OF DUAL CIGARETTE AND E-CIGARETTE USE OVER 12 MONTHS

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Significance: Cigarette smokers who start using e-cigarettes often have a period of dual use. This report describes dual user's patterns of smoking and vaping over 12 months and characterizes the observed patterns using demographics as well as baseline smoking and vaping variables. This information has potential to guide targeted interventions for smoking cessation among dual users. **Methods:** Analyses used data from the no treatment, surveillance condition of an ongoing randomized controlled trial evaluating a smoking cessation intervention for dual users. Participants smoked at least one cigarette/week over the past year, vaped at least one time/week over the past month, and were not necessarily interested in quitting smoking. Of 575 enrolled (July, 2016, to June, 2017), 301 completed a survey at all assessment points: 3, 6, 9, and 12 months. The primary data points were 7-day point prevalence for smoking and for vaping at each assessment. Patterns of smoking and vaping over the 4 assessments were categorized. Single-sample tests were used to identify relatively unique characteristics of a category. **Results:** The sample was 54% male and 80% non-Hispanic White. Mean age of 33 years. Mean pre-vaping Heaviness of Smoking Index (HSI, 0-6) was 3.7. Three general patterns were observed with greater frequency: 38% were dual users throughout; 30% vaped throughout, but were not smoking at least once; and 23% smoked throughout, but were not vaping at least once. Of the remaining participants, 4% stopped smoking and vaping by 12 months and 5% exhibited some other pattern. Among continuous vapers, 74% stopped smoking by 12 months. Among continuous smokers, 49% stopped vaping by 12 months. In terms of other characteristics, continuous dual users tended to be older and have higher pre-vaping HSI. Continuous vapers tended to smoke less and vape more at baseline. Continuous smokers tended to have lower income, started vaping more recently, and vaped less at baseline. **Conclusion:** Approximately 60% of the participants continued smoking, either alone or with dual use of e-cigarettes. However, of those who vaped throughout, a substantial majority quit smoking. Whereas these longitudinal results cannot establish causality, they are consistent with other evidence on the potential efficacy of e-cigarettes for smoking cessation.

FUNDING: Federal

PS3-133

COMPARISON OF NICOTINE DELIVERY AND SUBJECTIVE EFFECT PROFILE OF JUUL, IQOS, AND COMBUSTIBLE CIGARETTES.

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Significance: "Pod mods" are a new style of electronic cigarette (ECIG) that have become increasingly popular among youth and young adults. Pod mods are small, portable ECIGs that use tanks or "pods" that are pre-filled with ECIG liquid. JUUL is a name brand pod mod that has become one of the most popular ECIGs on the market. Heated tobacco products heat tobacco electronically to produce an aerosol. IQOS is a heated tobacco product available in several countries. While these products are often marketed to combustible cigarette smokers, little empirical research has examined use of these products among smokers. **Methods:** In this study, regular cigarette smokers with less than 5 lifetime uses with IQOS or JUUL ($n=17$ participants; 13 men) completed a within-subject study that used standard clinical laboratory methods to investigate nicotine delivery, physiological response, and subjective effects after 10 puffs (~30s inter-puff interval) and a 60-minute *ad libitum* bout from JUUL, IQOS, or own brand combustible cigarettes (as a control condition). **Results:** Assessment of plasma nicotine for 16 participants indicated that JUUL increased plasma nicotine concentrations significantly to an average of 10.5 ng/ml nicotine after the 10-puff bout and to 12.5 ng/ml nicotine after the 60-min *ad lib* bout. IQOS increased plasma nicotine concentrations significantly to an average of 15.1 ng/ml nicotine after the 10-puff bout and to 12.1 ng/ml nicotine after the 60-min *ad lib* bout. OB increased plasma nicotine concentrations significantly to an average of 21.3 ng/ml nicotine after the 10-puff bout and to 23.2 ng/ml nicotine after the 60-min *ad lib* bout. Participants' (N=17) ratings of "urges to smoke" were reduced significantly following JUUL, IQOS, and OB use. Participants rated OB as significantly more satisfying than JUUL and IQOS. **Conclusion:** JUUL and IQOS deliver physio-



logically active doses of nicotine and suppress withdrawal in cigarette smokers naïve to JUUL and IQOS. Nicotine delivery likely contributes to these products' potential as a smoking alternative and also potential for abuse among non-smokers, especially youth.

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PS3-134

REASONS TO USE E-CIGARETTES AMONG YOUNG ADULTS: RESULTS FROM A CONVENIENCE SAMPLE

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Significance. E-cigarette use among U.S. young adults is now a major public health concern that continues to increase at alarming rates. Efforts to understand underlying reasons for e-cigarette use are imperative for developing evidence-based interventions and regulatory policies for this vulnerable group. The current study aimed at (a) exploring reasons for using e-cigarettes in a sample of young adults and (b) examining the associations between these reasons and user characteristics. **Methods.** Participants included young adults (N=41) who reported being current e-cigarette users (daily use of 1ml of e-liquid for ≥ 3 months). Participants attended one laboratory session where they completed a survey exploring reasons for currently vaping. Additionally, we collected information about current and prior smoking and vaping (e.g., frequency, intensity), nicotine dependence, withdrawal symptoms, craving, and cotinine levels. **Results.** The most commonly reported reasons for vaping in the overall sample were "e-cigarettes are less harmful to people around than cigarettes" (82.9%), "e-cigarettes are less harmful to me than cigarettes" (81.0%), and "curiosity" (77.8%). Compared to never smokers, former smokers were more likely to report "using e-cigarettes at times/places where smoking isn't allowed" (100% vs. 55.2%, $p=.015$) and using "e-cigarettes helps people quit smoking" (69.3% vs 13.8%, $p=.001$) and less likely to report "I like socializing while vaping" (65.5% vs 23.1%, $p=.027$). E-cigarette users consuming ≥ 2 ml per day and liquids with ≥ 10 mg/ml were more likely to report using e-cigarettes because they "are less harmful to me than cigarettes" compared to those consuming ≤ 1.5 and ≤ 9 mg/ml, 95.0% vs. 68.2%, ($p=.027$) and (94.7% vs 42.9%, ($p=.039$) respectively. **Conclusions.** Our results offer evidence of the importance of perceived harmfulness of e-cigarettes and curiosity as principal motivators for e-cigarette use among young adults. History of cigarette smoking, and consuming both high amounts of e-liquid and e-liquid with high nicotine concentration were identified as the strongest factors determining reasons to use e-cigarettes. Factors motivating e-cigarette use should be targeted in both prevention and intervention strategies.

FUNDING: Federal

PS3-135

PRELIMINARY RESULTS FROM A CLINICAL TRIAL OF A SPANISH-LANGUAGE SELF-HELP INTERVENTION

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Significance: Hispanics/Latinxs are the largest minority group in the United States, yet there have been relatively few tailored interventions for Hispanic/Latinx smokers. There is a need for culturally relevant interventions responsive to the needs of a diverse Hispanic/Latinx population. Our team translated and culturally adapted for Spanish-speaking smokers an efficacious English self-help smoking cessation intervention. This intervention, *Libre del Cigarillo* (LDC), is being tested in a randomized controlled trial with smoking status collected every 6 months for 2 years. We examined preliminary results from this trial at the 6- and 12-month assessments. **Methods:** Participants (N=1,417) smoked ≥ 5 cigarettes/week over the past year, were living in the US, and were monolingual Spanish or bilingual and preferred health-related material in Spanish. Participants were randomly assigned to Usual Care (UC; an NCI booklet) or the LDC intervention comprising a series of booklets and pamphlets delivered monthly over 18 months. Baseline surveys assessed demographics, smoking behavior, and attitudes about quitting. The primary outcome was 7-day point prevalence abstinence. **Results:** The sample was 52% male; 41% had an annual income less than \$10K; mean age was 49.7 years; 82% smoked more than 20 CPD; Mean FTND was 5.0. Generalized estimating equations were used to evaluate treatment, time, and their interaction on abstinence at 6 and 12 months for the 1,012 participants who returned at least 1 follow-up survey. Baseline covariates that predicted missing data (e.g., age) or abstinence (e.g., FTND) were included in the model. Analyses revealed overall greater abstinence for those receiving the LDC intervention as compared to UC ($p<.0001$), with significantly different abstinence rates at both 6 months (26% v 13%, $p<.0001$) and 12 months (34%

v 20%, $p<.0001$). **Conclusion:** Preliminary results support the efficacy of an extended self-help smoking cessation intervention for Hispanic/Latinx smokers. This intervention has potential to improve the reach of smoking cessation assistance to a large underserved population of Spanish-speaking individuals throughout the US.

FUNDING: Federal; State

PS3-136

IMPLEMENTATION CHALLENGES AT A TOBACCO CESSATION CLINIC IN LAGOS, NIGERIA

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Significance: Nigeria, with smoking prevalence rates nearing 20%, has poorly implemented the WHO FCTC and tobacco control laws. Dentists have a unique opportunity to promote tobacco abstinence and cessation of tobacco use. This study assessed the effectiveness of interventions and fledgling difficulties encountered in a tobacco cessation dental clinic setting in Lagos, Nigeria. **Methods:** A 2 year retrospective audit of the case files of 120 patients referred to the Preventive dentistry clinic of Lagos State University Teaching Hospital for tobacco smoking cessation was conducted. Dependence was assessed using the Fagerström and CAGE questionnaires. Descriptive statistics was used to quantify variables such as age, gender, level of dependence and abstinence rates. Chi-square test was used to determine the relationship between categorical variables. Statistical significance was set at 5% ($P \leq 0.05$). **Results:** Most of participants (118; 98.3%) were males (mean age: 26.0 \pm 9.5 yrs). Tobacco use distribution was cigarettes only (87%), marijuana and cigarettes (8%); and cigarettes and hookah (5%); average no smoked daily was 18.0 \pm 7.0. Sixty five (54.2%) subjects had a moderate level of dependence while 21 (17.5%) had a high level. After assessing willingness to quit, and using the 5 R's, 80 (66.6%) of subjects, majorly those with mild dependence were willing to quit. Of these, only 16 (20%) attended follow up clinics. Abandonment rate for the cessation program was 91.66% after 1 month. Subjects with high dependence and those between 20-30 year of age were significantly more likely to drop out ($p<0.000$). Most subjects opted out of the cessation program once they completed their other dental treatments. Loss of interest, cost and inability to access NRTs were the most cited reasons for drop-out. At the end of the review period, only 5 (6%) subjects remained abstinent. **Conclusion:** Our study observed low quit-rates in this cohort of patients attending a dental clinic-based tobacco cessation clinic. There is however no funding or direct training for personnel by the government, while the hospital pharmacy and most private pharmacies around it do not stock nicotine replacement therapies. There is also no dedicated telephone lines or website to assist quitters and the clinicians use their personal phones for follow up. A broad policy implementation effort to strengthen the system is advocated.

FUNDING: Unfunded

PS3-137

PREMENOPAUSAL FEMALE SMOKERS WITH ELEVATED DEPRESSIVE SYMPTOMS REPORT MORE INTENSE WITHDRAWAL DURING NATURALISTIC SMOKING

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SIGNIFICANCE: Smokers with elevated depressive symptoms compared to those with low depressive symptoms report greater severity of withdrawal during smoking cessation attempts and are less likely to succeed with quitting smoking. Furthermore, depressive symptoms may be particularly relevant to the expression of smoking-related outcomes in female smokers. However, less is known about depressive symptoms in relation to the manifestation of withdrawal during naturalistic smoking and in an exclusively female sample. **METHODS:** Premenopausal female daily cigarette smokers completed a baseline screening session, which included assessment of depressive symptoms and cigarette dependence. Group criteria for elevated depressive symptoms was defined as Center for Epidemiologic Studies Depression Scale scores greater than 19. Eligible participants then completed 35 days of ecological momentary assessment including surveys assessing withdrawal symptoms prior to the first cigarette of the day and at random prompts throughout the day. **RESULTS:** Ninety-seven participants (elevated depressive symptoms=29, low depressive symptoms=68) had at least one data point and were included in the analyses. Female smokers with elevated depressive symptoms reported significantly more intense withdrawal ($p=.02$). While withdrawal symptoms were significantly greater prior to the first cigarette of the day compared to random prompts



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($p < .001$), there was no interaction of depressive symptoms and prompt type ($p > 0.05$).
CONCLUSIONS: Results of this study indicate that premenopausal female smokers with elevated depressive symptoms (vs. those with low depressive symptoms) report greater withdrawal symptoms. As participants were smoking as usual, findings suggest that females with elevated depressive symptoms tend to experience more intense withdrawal, which may impede positive smoking behavioral change. This finding could have implications for addressing smoking cessation among women with elevated depression- a population that may require greater or more intense treatments.

FUNDING: Federal; State

PS3-138

PATIENT PERSPECTIVES ON COMPONENTS OF ED-INITIATED TOBACCO TREATMENT INTERVENTION

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Significance: Multicomponent interventions to help smokers visiting an emergency department (ED) are efficacious. We recently completed a 4x4 factorial study using the Multiphase Optimization Strategy (MOST) to allow us to study the efficacy of the individual components. The goal of this substudy was to better understand subjects' experience with the four interventions, potential barriers and facilitators to their use, and recommendations for improvement. **Methods:** We interviewed 63 subjects who had received at least one of the four interventions (brief motivational interview, 6 weeks of nicotine patch and gum, active referral to the state quitline, and NCI's SmokefreeTXT program). They completed individually administered, audio-recorded, semi-structured interviews via telephone. The sample was balanced across gender and the 15 intervention arms. Interviews were transcribed, entered into ATLAS.ti, and thematically analyzed using the constant comparative method, until data saturation was achieved. **Results:** The sample included 51% males, 38% Black, 35% White, 24% Hispanic, and 3% Other; mean age was 43.5 years (11.3 S.D.). Subjects generally liked the interventions they received. Most said they had reduced their smoking frequency; 4 (6%) quit entirely, 29 (46%) decreased intake by at least half, and 20 (32%) reduced an unspecified amount. Four themes emerged: (1) clinical context and venue strongly influenced motivation to quit; (2) intervention content informed subjects about the physical benefits of quitting, suggested coping strategies, and periodically reminded them of their goal to quit; (3) subjects' receptivity to messages depended upon framing and timing, and (4) recommendations to tailor the interventions to consumers' needs and preferences. **Conclusion:** The data suggest that individuals wishing to quit smoking typically prefer both medications and counseling. Medications help reduce physical cravings, but psychosocial interventions help sustain motivation and positive attitudes about quitting, equipping individuals with effective and realistic coping skills. Implications for future intervention development will be discussed.

FUNDING: Federal

PS3-139

DOES CAFFEINE CONSUMPTION AFFECT THE SELF-ADMINISTRATION OF NICOTINE VIA ELECTRONIC CIGARETTE?

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Caffeine and nicotine are two of the most widely consumed psychoactive substances in the world. Epidemiological research shows a high rate of co-use. Previous animal studies have shown that caffeine increases the self-administration of nicotine but the evidence in humans remains inconclusive. This study aimed to investigate the effect of acute, oral caffeine ingestion on nicotine consumption and puffing topography in healthy electronic cigarette (EC) users. It also aimed to examine the effect of caffeine on the subjective effects of nicotine. A single blind, within participant, counter-balanced design was used. Participants ($n=15$) consumed caffeinated (75mg) or decaffeinated (3mg) coffee (Nespresso™) 15 minutes preceding ad-libitum EC use over 60 minutes. Nicotine self-administration was measured using e-liquid consumption, puff duration and puff number. Subjective effects were measured using visual analogue scales. Caffeine significantly increased the self-administration of nicotine. It also significantly lengthened mean total puff duration and increased mean puff number. This increased puffing was persistently higher across all 60 minutes of EC use. However, caffeine did not significantly affect the subjective effects of nicotine reported by the EC users. These findings suggest that caffeine has the ability to potentiate the reinforcing effects of nicotine. Thus, smokers who drink coffee may be unknowingly increasing their nicotine self-administration due to their synergistic interaction. This suggestion has

potential implications for smoking cessation advice and public health policy. However, more research that is empirical is necessary to understand the pharmacological basis underpinning the interaction between these two widely used, psychoactive substances.

FUNDING: Unfunded; State; Academic Institution

PS3-140

MISS

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Significance: Greater Childhood Emotional Abuse (CEA), due to its association with risky behaviors and increased trait impulsivity, is prospectively associated with problematic substance use. This includes a positive prospective association between greater CEA and likelihood of initiating and maintaining electronic nicotine delivery system (ENDs) use, and elevated risk of marijuana abuse, in adulthood. Elevated trait sensation seeking (SS), a facet of impulsivity capturing the tendency to seek out novel and thrilling experiences, is also prospectively associated with earlier onset nicotine and marijuana use. SS and CEA also exhibit a robust relation, as CEA is associated with an increased vulnerability to engaging in risky behaviors. While ENDs users are more likely than non-users to report marijuana use, little work has examined what may differentiate likelihood of co-use among ENDs users. This gap is notable, as co-use of marijuana and nicotine is associated with maladaptive nicotine use indices such as greater nicotine dependence. The present investigation examined whether CEA and SS exhibit a cross-sectional association with a greater likelihood of co-using ENDs and marijuana. **Method:** A sample of daily ENDs users ($N=449$, $Mage=26.3$) completed self-report questionnaires on the Amazon Mechanical Turk (MTurk) platform, including assessments of SS (the Urgency, Premediation, Perseverance, and Sensation Seeking Impulsive Behavior Scale), CEA (Childhood Trauma Questionnaire), and marijuana and ENDs use history. **Results:** A logistic regression was performed, with a model that included CEA and SS predicting co-use was significant, $\chi^2(2)=12.965$, $p < 0.002$. The model explained 4.2% (Nagelkerke R²) of the variance in co-use and correctly classified 74.8% of cases. Greater CEA was associated with an increased likelihood of co-use ($B=0.53$, $p=0.016$), and greater SS was associated with a lower likelihood of co-use ($B=-0.10$, $p=0.005$). **Conclusions:** While greater CEA increases the likelihood of marijuana co-use among daily ENDs users, findings suggest that for daily ENDs users with elevated SS, marijuana use may not be perceived as a sufficiently novel, high-reward activity.

FUNDING: Unfunded; Academic Institution

PS3-141

CLINICAL AND BEHAVIORAL CHARACTERISTICS ASSOCIATED WITH OPIOID MISUSE AMONG US ADULTS

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SIGNIFICANCE: The opioid epidemic was declared a national public health emergency in October 2017, and costs US health insurers 72.5 billion dollars a year. Dentists are the primary sources of leftover prescriptions for non-medical use, with up to 54% after third-molar extractions. We investigated predictors of extended opioid use for 3+ months and examined associations with dental conditions. **METHODS:** Data were from the 2009-2014 National Health and Nutrition Examination Surveys for 14,071 adults 30+ years. Prescription opioids were hydrocodone, oxycodone, propoxyphene, codeine, tramadol, opium, morphine, fentanyl, hydro-morphone, meperidine, pentazocine, oxymorphone, or tapentadol. Study endpoints included severe periodontitis, untreated caries, and missing teeth. Tobacco use was self-reported. Data were analyzed using descriptive and multivariable techniques. **RESULTS:** Ever-use of prescription opioids for 3+ months was 6.1%. By tobacco use, prevalence was: never tobacco users (4.5%); combustible-only users (11.5%); non-combustible-only users, including e-cigarettes (10.8%); dual combustible and non-combustible users (16.2%). The strongest risk factor for extended use of prescription opioids was having multiple co-morbidities; odds were 1.84, 3.95, and 7.98 among those with 1, 2-3, and 4+ co-morbidities, compared to those with none. Compared to fully dentate persons, odds of extended opioid use were higher among those missing 5-8 (AOR=2.30); 9-12 (AOR=2.53); 13-16 (AOR=2.55); 17-20 (AOR=3.13), and 21+ teeth (AOR=2.99). Missing only anterior teeth did not predict extended opioid use; but missing posterior teeth increased odds by 2.67 or 1.53, with or without involvement of anterior teeth respectively. Missing maxillary teeth only did not predict extended opioid use, but missing mandibular teeth increased odds by 2.21 or 2.02, with or without involvement of maxillary teeth respectively. Having periodontitis only did not predict extended opioid use, odds increased though with having untreated caries, alone (AOR=2.31), or with periodontitis (AOR=1.52).



No associations existed between opioid use and caries or severe periodontitis. **CONCLUSION:** Despite being associated with missing teeth; prescription opioid use was neither associated with periodontitis nor untreated caries—the leading causes of tooth loss—suggesting opioid usage post-extraction. Given high co-use of prescription opioids among tobacco users, a holistic approach that screens and treats for multiple addictions could improve health outcomes.

in learning, memory, behavior regulation and sensory processing were activated in response to visual smoking cues. Identifying changes in neural responses to smoking cues could potentially be an indication of treatment efficacy. Future work will focus on exploring differences in smoking cue reactivity in quitters versus non-quitters.

FUNDING: Nonprofit grant funding entity

PS3-142

THE DEVELOPMENT AND PRELIMINARY VALIDATION OF ELECTRONIC NICOTINE DELIVERY DEVICE (ENDS) IMAGE CUES

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Purpose: Drug-related stimuli increase craving and can contribute to continued drug use and relapse. As such, cue-reactivity and attentional bias paradigms are often used to explore the association between stimuli, drug reward, and addictive behaviors. Currently, there are no validated ENDS-related stimuli for use in cue-reactivity research. The aim of this study was to develop and validate ENDS image cues using the International Affective Picture System (IAPS) procedure. **Methods:** A total of 120 ENDS-related images were assessed. ENDS users in the United States and Canada were recruited via Amazon MTurk. Eligible participants were aged 19 to 65, owned ENDS and e-liquids, and used them within the past month. Demographics, tobacco use, and ENDS use data were collected. Each participant rated 60 images one-by-one on dimensions of valence, arousal, and dominance using the IAPS Self-Assessment Manikin system where lower scores indicated greater feelings of happiness, excitement, and less perceived control. Principal component analysis identified images that elicited the greatest responses. **Results:** In March 2019, 448 eligible participants completed the study. After screening for patterned responses, the data of 411 ENDS users (201M, 210F) were included in the final dataset for analysis. Significant correlations between valence and arousal ($r=0.540$, $p<0.0005$), and valence and dominance ($r=-0.524$, $p<0.0005$) suggests that images that increase feelings of happiness also increased excitement and perceived control. Participant-level analyses revealed significant correlations between arousal and valence ($r=0.30$), and arousal and dominance ($r=0.42$), indicating that participants reporting greater arousal on average also reported greater happiness and less perceived control. ENDS dependence was correlated with both valence ($r_s=-0.197$, $p<0.0005$) and arousal ($r_s=-0.122$, $p<0.0005$). **Conclusions:** Subjective affect ratings are related to ENDS dependence and correlational findings were similar to IAPS validated databases for tobacco and alcohol cues, supporting the validity of this database. Additionally, affect data will allow researchers to select cues specific to their study aims.

FUNDING: State

PS3-143

EXPLORING NEURAL CORRELATES OF VISUAL SMOKING CUE REACTIVITY OVER TIME IN TREATMENT-SEEKING SMOKERS USING FUNCTIONAL MAGNETIC RESONANCE IMAGING (fMRI)

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Purpose: Smoking-related environmental stimuli can elicit smoking urges and cravings, which is associated with compulsive smoking and relapse. Previous literature has shown that decreased brain reactivity to smoking cues can predict abstinence; however, no studies to date have investigated brain reactivity longitudinally in treatment seeking smokers within a cessation program. We aim to explore the effect of varenicline and transcranial direct current stimulation (tDCS) treatment on smoking cue reactivity in daily smokers. **Methods:** Two baseline fMRI scans were conducted: one following overnight smoking abstinence, and one during satiety, where participants smoked as usual. Participants then received varenicline (1 mg) and tDCS for 12 weeks. The end of treatment scan occurred upon treatment completion. During each scan, participants viewed smoking-related and content-matched neutral photographic cues. Changes in blood oxygen level-dependent (BOLD) responses were measured and contrasted between smoking and neutral cues. Paired t-tests were used to evaluate differences in BOLD response a) between the abstinence and satiated scans and b) between baseline and end of treatment respectively. **Results:** To date, 14 participants (10M, 4F) have completed both baseline scans (mean age: 34.4 ± 5.3 ; cigarettes per day: 16.1 ± 5.2) and 6 participants (3M, 3F) have completed the end of treatment scan. At baseline, the insular cortex, anterior cingulate gyrus, paracingulate gyrus, middle and superior frontal gyri were significantly activated during nicotine abstinence when contrasting smoking over neutral cues (z -threshold >1.8 , $p<0.05$). Recruitment is ongoing and end of treatment data will be presented. **Conclusions:** In keeping with previous literature, these preliminary findings suggest that during nicotine abstinence, brain regions involved

PS3-144

SHIFTS IN E-CIGARETTE USE AND PERCEPTIONS AMONG COLLEGE STUDENTS: A 3-YEAR ANALYSIS

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Introduction: Research indicates that 45% of undergraduate students (18-25 years of age) endorsed using an e-cigarette at least once within their lifetime, and 12% of these students reported use within the past month (Allem, Forster, Neiberger, & Unger, 2015). Overall, youths and college students tend to view e-cigarette use as less harmful and less addictive than traditional cigarettes (Choi & Forster, 2014), with nearly 45% of young adults who ever used an e-cigarette viewing them as less harmful than traditional cigarettes (Sutfin, McCoy, Morrell, Hoepfner, & Wolfson, 2013). Identifying trends of perceptions towards these products is necessary in order to develop more effective interventions to reduce use among this population. **Methods:** In the present study, we assessed college undergraduates ($N = 1,161$) for demographics, e-cigarette use patterns and perceived risks and benefits of e-cigarettes as measured by the Risks and Benefits of E-Cigarettes (RABE) Pros and Cons subscales. We formed groups of participants corresponding to the year in which they completed the study (i.e., 2014, 2015, or 2016), so that we could examine changes over the 3-year period in e-cigarette use patterns and perceived risks and benefits of e-cigarettes. **Results:** Participants were primarily female (79.6%) and Caucasian (77.3%) with a mean age of 19.95 ($SD = 1.8$) years. On the RABE Pros scale, participant scores differed significantly across year, such that scores decreased over time. On the RABE Cons scale, participant scores also differed significantly across year, with scores decreasing over time. Significantly fewer participants endorsed trying e-cigarettes in the past year in 2016 vs. 2014 (15.1% vs. 24.3%). The proportion of participants endorsing that they used e-cigarettes daily did not differ by year of data collection. **Conclusions:** Findings suggest that among college students' perceived risks and benefits of e-cigarettes have decreased. Changes in perceptions towards e-cigarettes should be taken into consideration in the development of interventions targeting use among this population.

FUNDING: Academic Institution

PS3-145

EXAMINING THE DEGREE TO WHICH ESTABLISHED RELATIONSHIPS BETWEEN SMOKING EXPECTANCIES AND CIGARETTE USE OUTCOMES TRANSFER TO E-CIGARETTES

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Significance: Evidence has shown that expectancies are important determinants of a wide range of substance use behavior, including alcohol, cocaine, and cigarette use (1). Thus, expectancies are likely important determinants of vaping behavior as well. Prominent barriers to successful smoking abstinence include negative reinforcement (NR) and weight-management expectancies, particularly for women (2, 3). The current study investigated whether expectancies predict abstinence-induced increases in craving, an empirically-supported indicator with considerable utility for diagnoses and as a clinical outcome (4). Because of notable gender differences in smoking expectancies, gender was examined as a potential moderator. **Method:** $N=31$ daily e-cigarette users ($M=18$, $F=13$; 18-56yrs) completed measures of demographics and expectancies (Short Form Vaping Consequences Questionnaire), followed by a measure of urge to vape (Questionnaire for Smoking Urges-Brief) before and after a standardized 2-hour abstinence period. **Results:** Multiple linear regressions were conducted to assess whether expectancies predicted abstinence-induced craving increases. NR expectancies significantly predicted craving increases ($F(2, 28)=6.33$, $p=.014$; $R^2=.31$). While including gender as a predictor significantly increased the overall model fit ($F(3, 27)=6.19$, $p=.002$; $R^2=.41$), gender did not moderate the observed relationship. Multiple regressions examining each gender independently indicated that the model was a significant predictor of craving increases only for men, ($F(2, 17)=18.57$, $p<.001$; $R^2=.71$), but not for women ($F(2, 10)=1.46$, ns). Weight management expectancies were not found to be significant predictors of craving increases. **Conclusion:** Understanding vaping motives is crucial for effective treatment development. This study is the first, to our knowledge, to examine expectancy in daily



e-cigarette users in relation to urge increases following brief abstinence. Based on this preliminary research, treatments targeting NR and anxiety/coping will be beneficial, particularly for men. Thus, established findings in the cigarette literature appear to extend to e-cigarettes; expectancies related to urge increases following abstinence likely indicate greater cessation difficulties (5). Weight management motives may also play a role in cessation difficulties through a pathway not examined in the current study (e.g. reduced contemplation/readiness to change).

FUNDING: Unfunded; Academic Institution

PS3-146

ADDRESSING SOCIODEMOGRAPHIC DISPARITIES IN TOBACCO USE, TREATMENT, AND CESSATION AMONG CANCER PATIENTS USING AN EQUITY-BASED APPROACH

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SIGNIFICANCE: Limited research addresses tobacco smoking among underserved cancer patients. We (a) estimated racial/ethnic and insurance status differences in smoking among patients at two Northeast Ohio cancer centers, and (b) applied a health equity lens to the Implementation Stages Model and the RE-AIM QuEST framework, to implement the Tobacco Intervention and Psychosocial Support (TIPS) service in two oncology specialties. **METHODS:** The implementation stages included exploration and organizational engagement, installation, implementation, and evaluation. We standardized electronic health record (EHR) documentation of tobacco use, and developed referral processes. TIPS consisted of multi-format, targeted cognitive behavioral therapy (CBT) combined with FDA-approved pharmacotherapy. EHR data were drawn to evaluate tobacco use prevalence, reach, and engagement pre-to-post implementation. **RESULTS:** Pre-implementation: The overall prevalence of current tobacco smoking was 33%, including 40% of African Americans, 33% of whites, and 35% of Hispanics. Among Medicaid insured patients, 58% were smokers, followed by 32% of uninsured/self-pay, 31% of those with Medicare, and 30% of commercially/managed care insured. Only 11% of smokers received any cessation treatment, which was less likely among African Americans and Medicaid-insured patients. Post-implementation: The prevalence of current smoking was 30%, and demographic differences in treatment were narrowed or eliminated. Forty-five percent of smokers received counseling and/or pharmacotherapy - a 309% increase. Few smokers declined TIPS services (4%), and 63% of referrals completed at least 1 session. Self-reported smoking status (7-day point prevalence abstinence; ppa) was comparable across whites (39%), African Americans (36%), and Hispanics (35%). **CONCLUSIONS:** Pre to post implementation data demonstrated narrowed disparities in cessation treatment and engagement, and no racial/ethnic differences in smoking abstinence. This study was among the first to demonstrate the potential of dissemination and implementation science to increase equitable access to evidence-based tobacco treatment among cancer patients.

FUNDING: Federal; Other

PS3-147

ADHERENCE ACROSS EIGHT WEEKS OF ECOLOGICAL MOMENTARY ASSESSMENT IN TREATMENT-SEEKING TOBACCO SMOKERS: TIME COURSE AND MODERATORS

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Researchers increasingly use ecological momentary assessment (EMA) to understand tobacco use in the natural environment. The richness and ecological validity of EMA data are a direct function of participant adherence. Though literature suggests that EMA adherence declines over time, even in relatively brief (~1 week) studies, few studies report adherence over time (days, weeks) and even fewer examine potential moderators of adherence. Here we focus on participant and study characteristics that moderate EMA adherence among 110 smokers (56% female; 28% racial/ethnic minority; 51% employed full-time, mean[SD] age = 55.2[8.6], baseline CPD = 18.7[7.3]) participating in an ongoing varenicline RCT (NCT03262662). Over 8 weeks (4 pre-quit, 4 post-target quit date [TQD]), participants earned \$1 each for completing a morning assessment (MA; ~3 min) and 4 random alarms (RAs; ~2 min) each day via smartphone (lab-sup-

plied for 60%). Overall, adherence was higher for MAs (82%) than RAs (63%), $p < .001$, $\eta_p^2 = 0.63$, lower among participants employed full-time (71%) vs. those who were not (78%), $p = .01$, $\eta_p^2 = 0.07$, and higher among participants using lab-supplied phones (76%) compared to participants using their own phones (70%), $p = .03$, $\eta_p^2 = 0.04$. Age was unrelated to adherence in this sample. Adherence declined linearly across weeks (from 80% in Week 1 to 65% in Week 8, $p < .001$, $\eta_p^2 = 0.29$), an effect that did not vary between MAs and RAs, all $p > .15$. Multiple participant characteristics moderated the decline in adherence over time, including full-time employment, gender, and race (each uniquely moderated the decline in adherence). For example, adherence in Week 1 did not vary between participants who were employed full-time vs. those who were not, but adherence declined more rapidly among the former, $p = .01$, $\eta_p^2 = .06$. These data demonstrate that adherence to EMA continues to decline over extended assessment periods, and that the declines are systematically associated with important participant characteristics. Future work should attend to EMA adherence over time, including methods to maintain adherence in later phases of data collection among participant sub-groups.

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PS3-148

A PRELIMINARY INVESTIGATION OF SEX DIFFERENCES IN SUBJECTIVE CHALLENGE AND THREAT STRESS REACTIVITY IN DAILY SMOKERS

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Significance: Stress predicts persistent smoking and inability to quit, particularly for women. Stress appraisal is an important determinant of its consequences and may help account for the disproportionate impact of stress on smoking in women. **Method:** Adult cigarette smokers completed a modified Trier Social Stress Test (TSST) wherein they were randomized to receive positive or negative non-verbal feedback from confederates in order to elicit challenge or threat stress appraisals, respectively. **Results:** A total of $n = 64$ participants enrolled and $n = 59$ (62.7% male; 55.9% positive feedback) completed the TSST. On average, participants were 34.7 years old ($SD = 7.1$) and smoked 14.0 cigarettes daily ($SD = 4.9$); no differences in age, sex, or cigarette consumption were observed between feedback conditions. Paired sample t-tests found that participants reported significant increases in negative affect, urge to smoke, and nicotine withdrawal post-TSST (all $p < .001$). No significant main effects of feedback condition on these ratings were observed, although those who received negative feedback reported marginally more nicotine withdrawal than did those who received positive feedback ($F(1, 54) = 4.00$, $p = .05$; $f = 0.26$, medium effect). As compared to participants who received positive feedback, participants assigned to negative feedback reported that the task was significantly more demanding ($F(1) = 14.99$, $p < .001$; $f = 0.52$, large effect) and a significantly lower resource-to-demand ratio ($F(1) = 12.66$, $p < .05$; $f = 0.37$, medium-large effect), consistent with a threat appraisal. A significant interaction between sex and feedback condition was found in terms of post-TSST negative affect ($F(1, 54) = 5.27$, $p = .03$; $f = 0.08$, small-medium effect), accounting for 7.4% variance, and nicotine withdrawal ($F(1, 50) = 4.07$, $p = .04$; $f = 0.04$, small effect), accounting for 4.2% variance. Women who received negative feedback had higher post-TSST ratings of negative affect and subjective withdrawal symptoms than who received feedback or men. Sex did not moderate any additional post-TSST ratings. **Conclusion:** The modified TSST was successful in eliciting subjective threat responses in smokers as a function of context (i.e., negative social feedback). Women were particularly vulnerable to increases in negative affect and withdrawal following negative feedback during this social stressor that may render it more threatening. Sex differences in subjective responses to social threats (vs. challenges) may contribute to poor behavioral smoking outcomes.

FUNDING: Federal

PS3-149

CLINICAL CHARACTERISTICS OF ONCOLOGY PATIENTS ENGAGED IN TOBACCO DEPENDENCE TREATMENT

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Significance: Smoking cessation increases cancer treatment effectiveness and survival rates; but effective tobacco treatment is not systematically provided to most cancer patients (CPs). CPs face unique challenges to quitting including significant financial / psychosocial stress and a decreased value placed on future rewards caused by thoughts



of early mortality. Efforts to provide tobacco treatment services are hindered by no systematic examination of tobacco-related clinical characteristics of CPs. We aimed to characterize the clinical characteristics of CPs engaged in Roswell Park's Tobacco Treatment Service (RPTTS). **Methods:** Patients who report tobacco use in the past 30 days are automatically referred to RPTTS. Patients seeking assistance complete a comprehensive assessment and engage in evidence-based cognitive-behavioral treatment. **Results:** In 2019, about 21.1% of patients (n=708) who were referred engaged in treatment. Patients were middle-aged (M=59.1 (SD 11.1) years); 69.4% were women, 76.0% were White; 56.2% had early stage cancers (Stage I/II) in a full spectrum of cancer sites. Most (90.0%) had no physical limitations, but did not work outside the home (74.5%). About half (58.7%) had annual incomes \leq \$25K and some had higher education (46.5%). Patients were highly dependent (M=4.7 (SD 2.2) FTND); smoking M=15.5 (SD 9.1) cigarettes per day, initiating use at age 16.2 (SD 4.8), and reporting the longest time quit of $<$ 1.5 years (M=14.8 (SD 34.8) months). About half smoked menthol products and allowed smoking in their homes. Patients were highly motivated to quit, but had relatively low self-efficacy. Screening suggested that over half were above the cut-off for probable depression (M=17.6 (SD 13.3) CES-D). Delay discounting rates M=-4.8 (SD 2.4) were comparable to other treatment-seeking smokers. With a 48.3% response rate, 6-month 7-day point prevalence abstinence rates were 34.3% (complete case analysis) and 16.6% (intention-to-treat). **Conclusions:** Tobacco dependence treatment is effective for CPs. CPs seeking tobacco dependence treatment appear to be highly motivated, but also highly dependent and likely to report depressive symptoms.

FUNDING: Federal

PS3-150

POINT-OF-CARE IMPLEMENTATION OF SMOKING CESSATION TREATMENT IN OUTPATIENT CANCER CLINICS

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Significance: The National Comprehensive Cancer Network recommends that all patients with cancer who smoke be offered evidence-based cessation treatment, yet few comprehensive cancer centers in the US consistently deliver cessation medications and counseling referrals. Recent research suggests that treating tobacco use at the point-of-care in cancer centers may increase provision of smoking assessment and cessation treatment. To test this approach, we evaluated a bundled implementation strategy developed through the Cancer Center Cessation Initiative (C3I) Cancer Moonshot program, including electronic health record (EHR)-enabled point-of-care decision support and practice performance feedback to facilitate cessation interventions delivered within cancer care. **Methods:** Using a quasi-experimental design, we compared (a) tobacco use treatment rates among all patients who smoke with documented assessment (n=23,989) across all outpatient medical specialties in a large healthcare system between 6/2/18 and 3/31/19 to (b) treatment rates in Medical Oncology and Hematology/Hematologic Oncology where the point-of-care strategy was used (n=3,668). In these oncology clinics, medical assistants were trained to use the EHR module, which provides decision support for brief cessation advice and cessation counseling referrals via best practice alerts, brief verbal scripts, and simplified workflow. **Results:** Across all specialties, brief cessation advice was documented in 6.7% of unique patients who smoked. In point-of-care oncology clinics, rates of brief cessation advice were 17.4% and 26.5%, respectively. Across all specialties, cessation counseling referral was documented in 5.8% of unique patients who smoked. In oncology clinics, however, rates of cessation counseling referral were 31.2% and 34.2%, respectively. **Conclusion:** This study suggests that EHR-based point-of-care decision support with practice performance feedback was effective in increasing rates of cessation treatment 3-5 fold beyond rates observed in non-oncology control clinics. Further research is needed to optimize and evaluate the broader impact of this implementation strategy on smoking cessation practices.

FUNDING: Federal; Academic Institution

PS3-151

THE ROLE OF ANXIETY SENSITIVITY ACROSS DAILY AND NON-DAILY SOLE AND DUAL E-CIGARETTE USERS

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The advent of electronic nicotine delivery systems has led to significant changes in patterns of tobacco use in recent years. Unfortunately, our understanding of the profiles of tobacco users has not kept pace with the ever-evolving tobacco product landscape. Thus, there is a dearth of knowledge about how different patterns of tobacco use are associ-

ated with affect vulnerability factors, such as anxiety sensitivity (fear of arousal-related sensations), a well-known transdiagnostic risk factor for tobacco use maintenance and relapse. In the only study to examine this issue, Mayorga et al. (2019) found that daily, compared to non-daily, e-cigarette use was associated with higher levels of all three domains of anxiety sensitivity (physical, social, cognitive concerns). However, this study did not examine the effects of dual e-cigarette and combustible cigarette use in relation to anxiety sensitivity. This lack of attention is unfortunate as the majority of e-cigarette users also use combustible cigarettes. Thus, the purpose of the current study was to examine group differences in anxiety sensitivity among dual and sole daily and non-daily users of e-cigarettes. Participants were 600 past month e-cigarette users (52.1% female; 75.5% Caucasian; $M_{age} = 35.1$, $SD = 10.3$) who were divided into four groups: (1) daily e-cigarette users who also smoke combustible cigarettes (dual daily users; $n = 289$); (2) non-daily e-cigarette users who also smoke combustible cigarettes (dual non-daily users; $n = 169$); (3) daily e-cigarette users (daily sole users; $n = 81$); and (4) non-daily e-cigarette users (non-daily sole users; $n = 62$). Results indicated that dual daily users reported significantly higher levels of anxiety sensitivity physical $[F(3, 594) = 7.07, p < .001]$ and cognitive concerns $[F(3, 594) = 8.62, p < .001]$ compared to dual non-daily users and non-daily sole users. Additionally, dual daily users reported significantly higher levels of anxiety sensitivity social concerns compared to dual non-daily users. These results suggest that it may be the frequency of e-cigarette use that is associated with affect vulnerability rather than single compared to dual tobacco use.

FUNDING: State

PS3-152

TRANSCENDING THE BARRIER TO SCREENING FOR ADOLESCENT TOBACCO AND ELECTRONIC CIGARETTE USE IN REAL WORLD CLINICAL SETTINGS

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Significance: According to CA DPH, teen tobacco/vapor use among California high school students is about 13.6%, and approximately 38% of CA teens have tried marijuana. Reports from SCPMG health plan, population 269,799 adolescents, showed a 0.2% prevalence for tobacco and marijuana use. SCPMG teens now report on behaviors during vitals-taking conducted by nurses in front of parent/guardians. We hypothesized that the presence of guardians in vital-taking leads to invalid data. Our survey seeks to test this, examine other reasons for the discrepancy, identify intervention strategies, and develop an improvement plan. **Methods:** We surveyed 207 KP-SCAL members age 12-17 from medical centers in the KP-Service Areas of Inglewood, Baldwin Hills, and Venice, CA. We worked with a teen advisory council and pediatricians, to create a survey in online and paper formats, and to develop a protocol for clinical settings. We then sent the survey through review channels: Clinical Leadership, Local Area Compliance, SCPMG Legal, and SCPMG Human Subjects Review Board. The surveys are incentivized and anonymous and administered by pediatricians during confidential exams. **Results:** Between 7/8/19 and 8/12/19, 207 surveys were received from youth age 12-17 attending pediatric appointments with SCPMG Pediatricians. Teens have preferred paper surveys. Of patients surveyed, 56% are male, and 43% female. Forty-seven percent of patients surveyed were African-American/Black, and 29% Hispanic/Latino. Of youth reporting, 6.31% have ever tried a cigarette, 6.83% have tried JUULs, 15% have tried vape pens, and 7% have tried tank devices. Among surveyed youth, approximately 15% have tried smoking marijuana, while 14% report having consumed edible marijuana. Of marijuana users, approximately 15% reported trying it only once, while 3.09% report using multiple times per week. When surveyed about preferred methods for intervention, teens preferred text messages (48%), followed by 1:1 sessions at the doctor's office with an educator/doctor (25%), and on-line education class (25%). **Conclusion:** For accurate clinical data, teen tobacco and marijuana use need to be documented in a different manner. Administration of the survey by a trusted adult in a confidential setting seems to facilitate more accurate answers. Through survey administration we learned that future interventions will have to address dual use of marijuana and tobacco, and that future clinical research needs local, dedicated research staff to coordinate all aspects of pilot administration.

FUNDING: Other



PS3-153

NICOTINE DELIVERY AND ABUSE LIABILITY OF POD-MOD ELECTRONIC CIGARETTES COMPARED TO COMBUSTIBLE CIGARETTES

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Introduction: The abuse liability and efficient delivery of nicotine from electronic cigarettes (ECs) compared to cigarettes is likely a determining factor in smokers' and dual users' ability to completely substitute ECs for cigarettes. New pod-mod ECs, such as JUUL, are different from previous ECs, with high levels of nicotine in their e-liquid and use of nicotine salts, which may reduce irritation and facilitate inhalation. The current study examines differences in nicotine delivery and abuse liability between a popular pod-mod, JUUL, and usual brand cigarettes (UBC). **Methods:** Seven smokers ($M_{age} = 38.3$ years; 71% women) completed a pharmacokinetic (PK) assessment consisting of two, 10-puff bouts using their UBC in one session and JUUL (5% nicotine) in the other in a randomized crossover design. Plasma nicotine levels and urges for nicotine (QSU-Brief) were measured at 0, 5 (immediately after 10-puff bout), 7, 15, and 60 minutes during each PK assessment. **Results:** Participants' Cmax for UBC was 17.6 ng/mL and 10.0 ng/mL for JUUL. Tmax for JUUL was 3.9 minutes and 7.0 min for UBC. No significant differences in plasma nicotine concentrations emerged by time points during the PK assessment between products. Between product comparisons for QSU revealed significant differences for the QSU Relief factor by product at 5 minutes such that craving/urge was significantly greater for UBC ($M = 17.7$) compared to JUUL ($M = 8.7$; $p = .014$). **Conclusions:** The current study is one of the first to characterize nicotine delivery and urge reduction of JUUL in comparison to cigarettes. While users did not achieve cigarette-like levels of nicotine delivery with JUUL, it showed shorter Tmax than UBC. Immediately following the 10-puff bout, UBC was associated with greater cravings than JUUL, which may indicate that UBC did not reduce cravings as effectively as JUUL.

FUNDING: State; Academic Institution

PS3-154

DEPRESSIVE, ANXIETY, & POST-TRAUMATIC SYMPTOMATOLOGY AS MODULATORS OF NON-TOBACCO FLAVORS AND NICOTINE CONTENT ON E-CIGARETTE PRODUCT APPEAL IN YOUNG ADULT VAPERS

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SIGNIFICANCE: Extant work suggests an increasing prevalence of electronic cigarette (e-cigarette) use in young adults with greater levels of psychopathology. However, it is unknown whether e-cigarette products of different non-tobacco flavors (e.g., menthol, sweet flavors) and nicotine concentration levels may differentially appeal to vapers with greater psychopathology. This laboratory study of young adult vapers tested whether reported levels of depressive, anxiety, and post-traumatic symptomatology moderated the individual and interactive effects of sweet and menthol (vs. tobacco) flavors and nicotine-containing (vs. nicotine-free) e-cigarette solutions on product appeal ratings. **METHODS:** Young adult vapers ($N=100$) were administered standardized e-cigarette doses varied by Flavor (sweet, menthol, tobacco) × Nicotine (nicotine-containing [6 mg/mL], nicotine-free) within-subject, double-blind design. Participants rated each dose's appeal (0-100 scale) and completed self-report measures of general depression, social anxiety, panic disorder, and traumatic intrusions. Depressive, anxiety, and post-traumatic symptomatology were tested as between-subject moderators of main and interactive effects of Flavor and Nicotine in multilevel linear models. **RESULTS:** Main effect models adjusting for relevant covariates demonstrated that appeal ratings were higher for sweet and menthol (vs. tobacco) flavors ($ps < .05$) and appeal was lower for nicotine-containing (vs. nicotine-free) solutions ($ps < .05$) in the overall sample. We found significant interactions between depressive, anxiety, and post-traumatic symptoms and Flavor and Nicotine for product appeal ($ps < .05$), such that nicotine's unappealing effects were suppressed by sweet flavors and by menthol among vapers reporting greater levels of depressive, anxiety, and post-traumatic symptomatology. **CONCLUSIONS:** Menthol and sweet-flavored e-cigarette solutions may suppress nicotine's unappealing qualities in young adult vapers with poorer psychological health. Future work exploring mechanisms underlying the interactive effects of non-tobacco flavors and nicotine content in vapers with greater psychopathology are warranted.

FUNDING: Federal

PS3-155

REFERRAL AND RECRUITMENT OF WOMEN VETERANS TO CO-ED VS. WOMEN-ONLY TOBACCO TREATMENT BASED ON MILITARY SEXUAL TRAUMA

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Significance: The complexity of tobacco use among Women Veterans (WV) is evidenced by their 28.9% smoking prevalence compared to 13.6% among civilian women. Since 1988, the Women's Clinic of Veterans Affairs Loma Linda Healthcare System (VALLHCS) conducted ongoing screening and referral to specialty co-ed tobacco treatment. In 2017, to enhance tobacco treatment participation, we implemented a rigorous approach (following letters, emails, and phone calls) to recruit WV into a Women-Only Tobacco Treatment Support known as Lady Butt Busters (LBB). **Methods:** We used the Veterans Health Administration (VHA) Corporate Data Warehouse to determine "ever tobacco users" enrolled in primary care in the VALLHCS (2000-2015). We collected referral and participation rates into specialty co-ed tobacco treatment to determine gender barriers to treatment. We analyzed January 2017- August 2019 consults to determine referral and participation in LBB and prevalence of military sexual trauma (MST). **Results:** Of the 39,616 "ever tobacco users" (Loma Linda VA), WV had 5.9% ($n=2,331$) and Male Veteran had 94.1% ($n=37,285$) prevalence. There was no difference in referral rates between WV and MV, however, MV were 26% more likely to participate in treatment ($p=0.02$). There was no difference in referral rates among WV based on MST status, however, WV with a positive MST screen were 54% more likely to engage in tobacco treatment ($p=0.03$). Only 33% (29/88) of referred WV joined LBB support group. As of August 2019, 12 of the 29 (41.3%) high-risk WV who attended the bi-weekly LBB became abstinent, and 8 (27.6%) have reduced the number of cigarettes/days. At least 11/29 (38%) have a positive MST screen. **Conclusions:** August 2017-August 2019 marked the first time in 31 years when WV consistently bonded in tobacco treatment support - reflective of the appeal the LBB's gender-exclusive environment provides for WV to address psychosocial treatment barriers. Future inquiry needs to discover other Women Veteran-specific barriers to tobacco treatment with MST or other psychiatric co-morbidities. Delayed effects of a dominant male military setting creates gender barriers in the Veteran experience.

FUNDING: Unfunded; Academic Institution

PS3-156

THE ASSOCIATION BETWEEN E-CIGARETTE USE, WITH AND WITHOUT CIGARETTES OR ALCOHOL, AND MENTAL HEALTH SYMPTOMS IN AMERICAN ADULTS AGED 55 AND OLDER

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Older adults (adults ages 55 and older) are transitioning to electronic cigarettes (EC) as a smoking cessation tool in order to reduce health risks associated with conventional cigarette (CC) use. Further, the prevalence of co-occurring tobacco and alcohol use and mental health outcomes has remained steady in this population over time, signifying low success in reducing substance use in this population. However, the patterns of EC use, particularly concurrent binge alcohol and tobacco use as well as mental health disorders remains understudied in this population. This study details the relationship between certain tobacco use patterns, including ECs, and mental health outcomes, defined as internalizing (IMHS) and externalizing mental health symptoms (EMHS). Data from American adults ages 55 and older who participated in Wave 1 ($N = 7,068$) and Wave 2 ($N=6,273$) of the Population Assessment of Tobacco and Health (PATH) were used to test the associations between mental health outcomes with past-month EC only, CC only, binge alcohol use only, and their combination using a series of multinomial regression models. An increasing level of IMHS was significantly associated with past month use of ECs with CCs or BA compared to no substance use. The patterns of association were consistent in Wave 1 ($RRR_{wave1} = 1.24$ [95% CI = 1.03, 1.51]) and Wave 2 ($RRR_{wave2} = 1.13$ [95% CI = 1.00, 1.27]). In Wave 2, higher levels of IMHS were associated with EC-only use relative to having no substance ($RRR = 1.45$ [95% CI = 1.14, 1.84]). No significant association between EMHS and any substance use pattern was detected. EC use was strongly associated with IMHS, with or without CC or BA use, and these results will be helpful to researchers and health care providers focused on the older adult population. Additional studies are needed to understand the causal association between ECs and mental health disorders.

FUNDING: Unfunded



PS3-157

EFFECTS OF THE MONOAMINE OXIDASE INHIBITORS HARMANE, NORHARMANE, AND HARMINE ON INTRACRANIAL SELF-STIMULATION IN RATS

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Significance: Identifying novel constituents that contribute to tobacco addiction is essential for informing FDA regulation of tobacco products. While increasing preclinical data indicate that monoamine oxidase (MAO) inhibitors can have abuse liability or potentiate the addiction-related effects of nicotine, most of these studies have used general MAO inhibitors that are not present in cigarette smoke. Methods and Results: The goal of this study was to evaluate the abuse potential of the β -carbolines harmane, norharmane, and harmine, MAO inhibitors that are found in cigarette smoke, in an intracranial self-stimulation (ICSS) model in rats. The ability of norharmane to influence nicotine's acute effects on ICSS were also studied. When administered alone, none of the β -carbolines lowered ICSS thresholds at any dose studied (0.5 - 30 mg/kg, s.c.), suggesting a lack of abuse liability. Rather, all three β -carbolines produced dose-dependent elevations in ICSS thresholds, indicating an aversive/anhedonic effect. Harmane and harmine also elevated ICSS response latencies, suggesting a disruption of motor function, albeit with reduced potency compared to their ICSS threshold-elevating effects. Preliminary findings indicate that norharmane (2.5 mg/kg) did not influence the effects of nicotine (0.03 - 1.0 mg/kg, s.c.) on ICSS thresholds. Conclusions: These studies indicate that β -carbolines produce only aversive/anhedonic effects in an ICSS model when administered alone, and provide initial evidence that norharmane does not influence nicotine's effects on ICSS. Future work evaluating the addiction-related effects of nicotine combined with these and other MAO inhibitors present in smoke may be useful for understanding the role of MAO inhibitors in tobacco addiction and informing FDA tobacco regulation.

FUNDING: Federal; Academic Institution

PS3-222

THE FEASIBILITY OF A SMOKING CESSATION INTERVENTION USING FAITH-BASED TEXT MESSAGING DURING RAMADAN FOR SOMALI MUSLIM IMMIGRANT MEN

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Background: The prevalence of smoking among Somali Muslim male immigrants in Minnesota is 44%, much higher than the smoking rate for adult men in Minnesota (14.4%). Data suggest spontaneous smoking reduction during the month of Ramadan is common. Most Somali men own cell phones, making text messaging a viable mode for treatment delivery. The study aim was to evaluate the feasibility and impact of a faith-based, culturally-tailored text message intervention delivered during Ramadan on the smoking behavior of Somali men. **Methods:** Fifty adult male Somali cigarette smokers were recruited through community settings to participate in this observational study. They received text messages starting one week prior to, and throughout Ramadan. Seventy-eight text messages were delivered (2 per day), with approximately half faith-based and the rest about the risks of smoking and benefits of quitting. Smoking behavior was assessed at Weeks 4 (end of Ramadan), 8 and 16. Outcomes included feasibility, acceptability, and preliminary efficacy of text message intervention on smoking reduction and bio-verified abstinence. **Results:** The average age was 41 years, nearly all participants had been in the US for 5 years or longer. Average time to first cigarette was 1.8 hours at baseline, and 46% of participants smoked menthol cigarettes. Eighteen of 50 participants selected English and 32 selected Somali text messages. The retention rate was 46/50 (92%) at the Week 16 assessment. Subjects significantly reduced self-reported cigarettes per day (CPD) from 12.4 CPD at baseline to 5.8 CPD at Week 16 ($p < 0.001$). Of the seven subjects who reported quitting at week 16, five were verified as abstinent (expired CO < 8ppm). Nearly all participants indicated that they found the cultural and religious references encouraging on the Week 16 survey. **Conclusion:** This pilot study shows that text message intervention is feasible and acceptable to Somali

Muslim male smokers and that this modality is worthy of further study as a method for promoting smoking cessation during Ramadan. A randomized trial is needed to examine the efficacy of text message intervention for smoking cessation during Ramadan.

FUNDING: State; Nonprofit grant funding entity

PS3-223

EFFECTS OF NICOTINE VS NON-NICOTINE ELECTRONIC CIGARETTES ON SMOKING BEHAVIOR AND TOBACCO BIOMARKERS AMONG AFRICAN AMERICAN SMOKERS

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Significance. The objective of this clinical trial was to compare the effects of electronic cigarettes (e-cigs) with and without nicotine on patterns of combustible cigarette use and biomarkers of exposure to tobacco toxicants among African American adult smokers.

Methods. African American smokers ($n=234$) in Minneapolis-St. Paul were enrolled in a 12-week, single-blind, randomized controlled trial. Participants were assigned to either ad-lib use of 24mg/mL nicotine e-cigs ($n=118$), or 0mg/mL nicotine e-cigs ($n=116$) for 6 weeks. Surveys were administered at baseline, 2, 6, and 12 weeks, and urinary biomarkers NNAL and total nicotine equivalents (TNE) were assessed at baseline and 6 weeks. **Results.** On average, participants were 51 years old, 44% female, and low income (89% of participants earned <\$20,000/year). They smoked an average of 11.4 cigarettes per day (CPD); 88% used menthol cigarettes. There were no significant differences between treatment groups on demographic or smoking variables at baseline. At 6 weeks, the nicotine e-cig group reported using e-cigs 9.1 times per day compared to 11.4 times in the non-nicotine group (difference NS). Cigarette smoking decreased by 3.0 CPD in the nicotine group compared to 2.7 CPD in the non-nicotine group (difference NS). There were no differences in nicotine withdrawal symptoms between treatment groups. Neither NNAL nor TNE changed significantly between baseline and 6 weeks. In both groups, a majority reported using an e-cig would aid a future attempt to quit smoking (68% vs. 69%, difference NS). The majority (67%) believed e-cigs were 'somewhat' or 'much' lower risk than combustible cigarettes. **Conclusion.** Contrary to our hypotheses, the nicotine content of e-cigs did not affect the use of combustible tobacco products in this cohort of African American smokers. Potential explanations include that participants were not required to be interested in quitting or treatment, and therefore were not motivated to change cigarette smoking behavior, or that they did not use a sufficient amount of e-cig product to affect smoking behavior. Limitations of the study include that it was neither a quitting nor a switching study.

FUNDING: State; Nonprofit grant funding entity

PS3-224

EFFECTS OF SMOKING ENVIRONMENTS AND SMOKING CESSATION MEDICATION PRELOADING ON CUE-INDUCED CRAVING AND SMOKING BEHAVIORS

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Significance: We aimed to evaluate the effects of drug pretreatment (varenicline; nicotine replacement therapy (NRT); placebo) on personal smoking environment (PSE) cue reactivity, smoking behavior during a delay to smoking task (DST), and cessation outcomes during a quit attempt. We also evaluated the association between PSE reactivity and cessation outcomes during a quit attempt. **Methods:** Participants ($n=81$; mean [SD] cigarettes/day = 14.5 [7.0]) were randomly assigned to 1 week of preloading with varenicline, NRT, or placebo prior to a smoking quit attempt. Just prior to the quit attempt, participants underwent two cue reactivity sessions (neutral vs. PSE cues) while in an abstinent state. A DST followed each cue reactivity session. Participants then initiated a smoking quit attempt and returned to the lab for up to 4 follow-up visits. Linear mixed models were used to evaluate the impact of drug type on cue-induced craving and DST smoking behavior. Linear and logistic regression analyses were used to assess the impact of drug type on cue reactivity and smoking cessation outcomes. **Results:** Preloading condition did not affect cue-induced craving, but PSE cues provoked greater cue-induced craving ($p=0.006$). Randomization to NRT ($p=0.003$) or varenicline ($p=0.017$) resulted in a significantly smaller CO boost during the DST task versus placebo. Greater smoking-nonsmoking post-cue craving scores were associated with increased odds of lapse during the quit attempt ($p=0.018$). Randomization to NRT was associated with a greater number of days to lapse ($p=0.048$), while randomization to va-



renicline was associated with a trend toward greater number of days to lapse ($p=0.125$), during the quit attempt. A trend was observed such that greater cue reactivity was associated with fewer days to lapse ($p=0.085$). Conclusion: This study replicates earlier findings that PSEs provoke craving. However, we also provide preliminary evidence that PSE-provoked craving is not attenuated by first-line pharmacotherapies prior to quitting smoking. These data suggest that interventions—behavioral or pharmacological—that attenuate PSE reactivity could augment medication efficacy.

FUNDING: Federal

PS3-225

PROGRAM ON LUNG CANCER SCREENING AND TOBACCO CESSATION (PLUTO) STUDY: BASELINE CHARACTERISTICS AND CO-MORBIDITY AMONG PARTICIPANTS IN A SEQUENTIAL, MULTIPLE ASSIGNMENT RANDOMIZED TRIAL

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SIGNIFICANCE PLUTO is a SMART trial designed to test year-long combinations of evidence-based tobacco cessation treatment among patients participating in or eligible for lung cancer screening (LCS). Given the age and smoking history of this cohort, there may be a high prevalence of patients with medical co-morbidities and mental illness. We describe the baseline characteristics of PLUTO participants and highlight differences between patients with and without a history of mental illness. **METHODS** Current daily smokers 55-79 years of age eligible for LCS are enrolled. Demographics, smoking behavior, physical and mental health, and psychosocial data are collected at baseline. Patients are considered to have a history of mental illness if they report history of depression, anxiety disorder, post-traumatic stress disorder, or current use of medication for mental health. **RESULTS** Of 560 randomized participants, the mean age is 64 (range 55-79) and the majority (78%) report receipt of LCS. Participants smoke an average of 18 cigarettes per day, and 77% smoke within 30 minutes of waking. They have an average pack-year history of 51 years (range 10-160). The majority (85%) of participants have tried nicotine replacement therapy (NRT) and 59% have tried prescription smoking cessation medication in the past. Common co-morbidities include cardiovascular disease (38%), COPD (37%), diabetes (19%), and history of cancer (13%); 46% have breathing problems that limit their physical activity. Fifty-seven percent of participants report history of mental illness. Compared to participants without history of mental illness, those with history of mental illness are more likely to smoke within 30 minutes of waking (80% v 74%, $p=0.024$) and were more likely to have tried: quitting in the past year (48% v 35%, $p=0.004$), a quit program (39% v 32%, $p=0.059$), and NRT (88% v 81%; $p=0.022$). **DISCUSSION** Smokers participating in LCS are heavy smokers and have a high degree of nicotine dependence. Physical and mental health co-morbidities are common. Smoking cessation interventions delivered in the context of LCS may need tailoring to meet the needs of this medically complex population.

FUNDING: Federal

PS3-78

RISK PERCEPTIONS FOR SMOKING-RELATED DISEASES AMONG SMOKERS ELIGIBLE FOR LUNG CANCER SCREENING AND ASSOCIATIONS WITH QUIT READINESS

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Significance: Lung cancer screening (LCS) may influence smoking cessation behaviors through complex pathways, including through risk perceptions for smoking-related diseases (SRDs) and lung cancer (LC). **Objective:** We examined the associations of risk perceptions for SRDs and LC with recent attempts to quit or cut down on smoking. **Methods:** Cross-sectional analysis using baseline survey data of current smokers enrolled in a trial of tobacco treatment delivered in the context of LCS. We summarized risk perception scores in the following domains: LC risk, risk of SRDs, worry about LC, perceived severity of LC, perceived benefits of quitting, and overall risk score. We assessed the association of risk perceptions with cessation behaviors using adjusted logistic regression models. **Results:** 560 smokers from three sites completed a baseline survey and showed the following characteristics: 35.4% female, 89.6% white, 35% high school education or less, mean age 64.4 years, smoked an average of 17.7 cigarettes/

day. Most participants perceived a high likelihood of developing SRDs (73.3%) with fewer perceiving a high lifetime risk of developing LC (35.7%). Lung cancer was perceived to be severe (mean 9.2 [SD 1.2] on a scale of 0 to 10) and quitting was perceived to be beneficial (mean 10.2 [SD 1.4] on a scale of 0 to 12). In adjusted analyses, higher risk perceptions were positively associated with any attempt to quit or cut down in the past 30-days and any attempt to quit for at least 24-hours in the past year. Patients were more likely to have made a quit attempt in the past year for each point higher on the following scales: risk of SRDs (OR 1.1 [1.02-1.19]), worry about SRDs and LC (OR 1.2 [1.07-1.35]), perceived severity of LC (OR 1.23 [1.07-1.43]), and lifetime concern about LC (OR 1.3 [1.07-1.58]). **Conclusion:** In this cross-sectional analysis of smokers eligible for LCS, patients had relatively high risk perceptions for both cancer and non-cancer SRDs. Higher risk perceptions for SRDs and LC were associated with recent attempts to quit and cut down. Low risk perceptions for SRDs may be a target for enhancing quit readiness.

FUNDING: Federal



POSTER SESSION 4

PS4-1

HOW DO INITIATION AND CURRENT USE OF TOBACCO INFLUENCE SUBSEQUENT ACADEMIC PERFORMANCE AMONG US YOUTH A LONGITUDINAL ANALYSIS

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Background: Previous cross-sectional studies have shown a relationship between youth tobacco use and academic performance. Yet, it is unclear whether tobacco use influences subsequent academic performance. We examined how initiation and current use of tobacco products associate with subsequent academic performance among US youth. **Methods:** Data from 6,601 US youth who were never tobacco users at Wave 1 and completed Wave 1-3 surveys of the Population Assessment of Tobacco and Health (PATH) Study were analyzed. At Wave 2, participants reported ever (initiation) and current cigarette, cigar, e-cigarette, hookah, smokeless, and other tobacco product use. Academic performance was assessed at Wave 2 and Wave 3 (1=mostly F's; 9=mostly A's). Weighted linear regression models were used to assess the associations between Wave 2 ever/current use of any and specific tobacco products and Wave 3 academic performance, adjusting for Wave 2 demographics, internalizing and externalizing problems, and substance use problems. We further stratified the analysis by race/ethnicity. **Results:** Compared to never tobacco users, Wave 1 never tobacco users who reported Wave 2 ever using tobacco had lower Wave 3 academic performance (adjusted regression coefficient[ARC]=-0.51, 95% confidence interval[CI]=-0.64, -0.38). In the models that include specific tobacco product use, Wave 2 ever cigarette use (ARC=-0.54, 95% CI=-0.96, -0.11), ever e-cigarettes use (ARC=-0.30, 95% CI=-0.47, -0.12), and ever smokeless tobacco use (ARC=-0.92, 95% CI=-0.30, -0.15) were associated with lower Wave 3 academic performance. Similar patterns were observed with Wave 2 current tobacco use. These associations also vary by race/ethnicity, e.g., Wave 2 current e-cigarette use was associated with lower Wave 3 academic performance only among non-Hispanic white youth. **Conclusions:** Tobacco use initiation and current use among youth were associated with subsequent lower academic performance. Given that academic performance is an important factor for educational attainment which is linked to various positive health outcomes, our findings reinforce the importance of reducing all tobacco use among youth.

FUNDING: Federal

PS4-2

INFLUENCE OF INTERNET INFORMATION EXPOSURE ON THE SALIENCE OF HEALTH WARNING LABELS ON TOBACCO PRODUCTS, AN INTERNATIONAL PERSPECTIVE

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Significance: Mounting evidence has shown that the increasing internet information access and the proliferation of digital devices has dramatically changed people's cognitive processing of information. The load theory of attention and cognitive control holds that this greater volume of information may reduce the salience and influence of any specific or kind of information. Few studies explored this dilution effect in the health information domain to date. This study tests the hypothesis that the degree of internet access will be negatively related to the salience of health warning labels on tobacco packaging. **Methods:** The impact of country-level internet access (number of internet users per 10 people, International Telecommunication Union and World Bank), on label noticing and reading, were examined using smoker responses from International Tobacco Control Surveys in 21 countries. Multi-level models controlled for label design factors (content, size, location), personal characteristics (demographics, SES), quit intentions, familiarity of labels and anti-smoking topics, and perceived smoking risk. **Results:** Both label noticing and reading were highly variable across countries, ranging from 10.2% in the Netherlands (NL) to 82.4% in Thailand for noticing and from 12.8% in NL to 72.9% in Zambia for reading among those who reported noticing the labels. Country internet access was negatively associated with label noticing (log odds=-0.19, 95%CI: -0.24, -0.14) and reading among those who noticed (log odds=-0.12, 95%CI: -0.22, -0.02). Thus,

a 10% increase in country internet access is associated with a 17% decrease in label noticing and an 11% decrease in reading among those who noticed. **Conclusions:** In countries with more prevalent internet access, the greater exposure to information may reduce warning label salience. More generally, with the increasing volume of information that dilutes warning labels and other health messages, there is a greater corresponding need to develop strategies that will make important health messages, such as cigarette health warnings, more salient—repeating those messages across popular and widely utilized information channels (social media).

FUNDING: Federal; Academic Institution

PS4-3

LIKE A DRUG: ADOLESCENT E-CIGARETTE USE ASSOCIATED WITH COORDINATION AND CONCENTRATION

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Background Rates of adolescent depression are increasing in the US. Although youth use cigarettes to cope with stress or manage depression, less is known about the link between depression and e-cigarettes. Studies show that emotionally healthier adolescents are likely to use e-cigarettes. The link between e-cigarette use and specific psychological and physical aspects of adolescent daily life remains unexplored. Here we investigate the association of high school and college students' specific depressive symptoms and physical health status with e-cigarette use versus cigarette use. **Methods** 522 California adolescents were surveyed from March to July 2017. Survey measures included socio-demographic information, ever- and past 30-day use of e-cigarettes and cigarettes, depression symptoms (Patient Health Questionnaire (PHQ-9)), height, weight and experiencing mouth sores. Twenty-four multi-level mixed-effects ordered logistic regression models (using Bootstrap replication) were built to examine factors associated with specific depressive symptoms, difficulty in doing daily activities, normal Body Mass Index and experiencing mouth sores in the past 30 days. **Results** Adolescents were twice more likely to be fidgety/restless if they were in high school compared to college and if they had ever used an e-cigarette. They were 2.5 times more likely to have problems concentrating and lack coordination (moving too fast/slow/ fidgety/ restless) if they had ever used both a cigarette and an e-cigarette. Higher depression scores were associated with ever use of an e-cigarette, ever-use of both an e-cigarette and a cigarette, being female and belonging to high school. Participants were nine times more likely to have mouth sores and 46% less likely to have a normal Body Mass Index if they had ever tried both an e-cigarette and a cigarette. **Conclusion** Depressive symptoms associated with ever use of e-cigarettes are similar to those associated with alcohol and drug use in adolescents, rather than with just cigarette smoking. Future research must focus on the mental health impact of e-cigarettes, adolescent perception of these products and intersectoral efforts required to prevent use.

FUNDING: Federal

PS4-4

METHODOLOGY FOR PROSPECTIVELY ESTIMATING AGE OF INITIATION OF E-CIGARETTES USING INTERVAL CENSORING

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Significance: There is a lack of research on prospectively estimating the distribution of the age of initiation of electronic cigarette use in U.S. youth. Younger ages of initiation of tobacco product use are associated with greater exposure to nicotine, and a 2017 meta-analysis found that e-cigarette use was associated with subsequent cigarette initiation. This study sought to estimate the average age of e-cigarette initiation among youth never e-cigarette users, prospectively. **Methods:** Secondary analysis of the Population Assessment of Tobacco and Health (PATH) youth dataset (ages 12-17; n=16,160; N= 30,222,823) across waves 1 (2013-2014), 2 (2014-2015), 3 (2015-2016), and 4 (2015-2016) were conducted. Age of initiation was prospectively estimated using participant age; date of survey participation (calendar week/year); and the number of weeks between the last report of never use and the first report of ever use of e-cigarettes for users and the number of weeks between survey dates between the previous report of never use and current report of never use for non-users. An interval censoring method was implemented. The dataset was expanded using the survey weight to account for the complex survey design. Time-to-event analyses with interval censoring were used to estimate seven survival functions. **Results:** Youth participants were 50.5% male, 57.2% white, 15.7% black/African American, 5.1% Asian, 12.1% Hispanic, and



9.8% other race. Seven graphs show the survival function for use/non-use initiation for (i) overall, (ii) girls, (iii) boys, (iv) participants who reported that e-cigarettes were not harmful and not addictive, (v) participants who reported that e-cigarettes were not harmful but addictive, (vi) participants who reported that e-cigarettes were harmful and not addictive and (vii) participants who reported that e-cigarettes were harmful and addictive. **Conclusion:** Interval censoring is an appropriate method for estimating the age of initiation of e-cigarette use in a nationally representative sample of U.S. youth.

FUNDING: Federal

PS4-5

VAPING SUPPORTIVE OF SMOKING RELAPSE PREVENTION. QUALITATIVE FINDINGS FROM PHASE 2 OF THE LONGITUDINAL E-CIGARETTE TRAJECTORIES STUDY

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Significance: E-cigarettes may play a role in reducing the health-related harms of tobacco smoking, through not only assisting smoking cessation attempts, but also supporting long-term abstinence. Phase 1 of the E-Cigarette Trajectories Study showed that e-cigarettes meet the needs of many ex-smokers by substituting biopsychosocial aspects of tobacco addiction, with some finding vaping more pleasurable than smoking. Phase 2 aimed to explore longitudinal patterns and experiences of e-cigarette use in relation to smoking relapse. **Methods:** Qualitative interviews were conducted with 37 vapers/ex-vapers, 12-18 months after they first participated. Data were thematically analysed. **Results:** At Phase 2, most participants had maintained similar patterns of e-cigarette use since Phase 1. Twenty-three participants were vaping and not smoking, many noting a decrease in tobacco lapse behaviour/desire. Almost all were planning to continue vaping, although many reported a reduction in nicotine strength. Six were not vaping or smoking and had used a variety of methods (e.g. NRT, self-talk) to quit vaping alongside 'weaning off'. Eight had relapsed to smoking: they were less motivated to quit tobacco than other participants, experienced vaping as inferior to smoking, and most held negative beliefs about vaping culture and e-cigarette safety. **Conclusions:** The view that vaping leaves ex-smokers open to relapse through maintaining nicotine dependence is contradicted by the data, although further research is warranted given the qualitative sample. Relapse prevention interventions should consider educating quitters about the safety of vaping, offer strategies for managing lapse triggers, and ensure quitters have a satisfying e-cigarette setup and access to inclusive social support.

FUNDING: Nonprofit grant funding entity

PS4-6

THE IMPACT OF EXPOSURE TO AND ENGAGEMENT WITH TOBACCO-RELATED SOCIAL MEDIA ON TOBACCO USE BEHAVIORS IN THE 2014-2015 SAMPLE OF PATH ADOLESCENTS

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Significance: The declining rate of cigarette use among youth in the U.S. has been compromised by an increase in the use of electronic cigarettes (e-cigarettes), hookah, and cigars. These trends are concerning in the context of advances in social media that have created a novel channel for tobacco product content exposure for these emerging classes of tobacco products. This study sought to determine the impact of exposure to and engagement with tobacco-related content on social media on tobacco use outcomes in youth. **Methods:** Cross-sectional secondary analysis of youth participants (aged 12-17) from the 2014-2015 wave 2 Population Assessment of Tobacco and Health (PATH) study was conducted to examine the associations between exposure to and engagement with tobacco-related content on social media with exclusive past 30-day e-cigarette use, exclusive past 30-day combustible product use, and past 30-day dual combustible product and e-cigarette use. Exposure was assessed with "In the past 12 months, have you seen any tobacco-related content on social media sites?"; engagement was assessed with "In the past 12 months have you posted content about tobacco products on any social media sites?" Both questions were answered yes/no. Multiple logistic regressions were used, controlling for age, sex, race/ethnicity, frequency of social media use, household income, and parent level education. **Results:** Having seen any tobacco-related content on social media sites was significantly associated with exclusive past 30-day e-cigarette use (AOR= 1.93; 95% CI= 1.23- 3.01), exclusive past 30-day combustible product use (AOR= 1.41; 95% CI= 1.12-1.78), and dual past

30-day dual use of a combustible product and e-cigarettes (AOR= 1.50; 95% CI= 1.05-2.13). Similar results were estimated for engagement with tobacco products in social media sites. **Conclusions:** Results suggest that interventions and policies prohibiting posting about tobacco products on social media are needed to mitigate the impact of tobacco-related content on social media on youth tobacco-use.

FUNDING: Federal

PS4-7

ASSOCIATIONS OF DEPRESSION AND ANXIETY IN MARIJUANA AND TOBACCO USERS AMONG TEXAS YOUTH AND YOUNG ADULTS

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Significance: Social acceptability and greater legalization of recreational marijuana have contributed to increased use among young people including co-use with tobacco using novel techniques. Limited research examines the relationships between marijuana and tobacco co-use and mental health among youth and young adults. **Methods:** Data were from Wave 9 (May-July 2019) of the Texas Adolescent Tobacco and Marketing Surveillance System study (n=2458, M age= 18.50, SD= 1.55, 43% male). Adjusted multinomial logistic regression models were used to examine cross-sectional associations between (1) types of ever/lifetime users (never users, co-use of tobacco and marijuana, tobacco only, marijuana only) and their (1) depressive and (2) anxiety symptomatology, while adjusting for sex, SES, grade, and race/ethnicity. **Results:** At Wave 9, 40% had never used tobacco or marijuana, 37% were ever tobacco and marijuana co-users, 14% were ever only tobacco users, and 8% were ever only marijuana users. Also, 41% had clinically significant symptoms of depression and 44% of anxiety. Compared to never users, co-users [AOR: 1.41 (CI: 1.51, 1.72)] and marijuana only users [AOR: 1.50 (1.09, 2.06)] had increased odds of depressive symptoms, and tobacco only users [AOR: 0.75 (0.57, 0.98)] had decreased odds of anxiety symptoms. Compared to tobacco only users, co-users had a greater likelihood of having depressive symptoms [AOR: 1.41 (1.07, 1.85)] and anxiety symptoms [AOR: 1.48 (1.31, 1.93)], while marijuana only users had [AOR: 1.51 (1.04, 2.18)] greater odds of having depressive symptoms. **Conclusion:** Findings indicate that important relationships exist between co-use and marijuana only use and depression, and tobacco only use and anxiety. Addressing depression and anxiety may be beneficial in developing cessation or anti-smoking interventions for young people. Future research should study these relationships longitudinally, as well as the role of dependence to these products and mental health to better understand potential causal relationships.

FUNDING: Federal

PS4-8

A META-ANALYSIS OF SMOKING AND CIRCULATING HORMONE LEVELS AMONG PREMENOPAUSAL WOMEN: IMPLICATIONS FOR PREMENOPAUSAL BREAST CANCER

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Significance: Evidence to date suggests that pre-diagnostic circulating androgen and estrogen levels are associated with risk of breast cancer development among premenopausal women. Pooled analyses in postmenopausal women have found significantly higher androgens and estrogen levels in current heavy cigarette smokers than in nonsmokers. However, differences in circulating hormone levels by current smoking status among premenopausal women are not well understood. **Methods:** PubMed was searched (through January 2019) to identify all published articles that provided urinary or serum sex hormone levels by smoking status among premenopausal women who were not taking oral contraceptives. The hormones reviewed were cross-sectional assessments of progesterone, estradiol, testosterone, sex hormone-binding globulin (SHBG), dehydroepiandrosterone (DHEA) and dehydroepiandrosterone sulfate (DHEAS). A random effects model was used to pool the standardized mean differences (SMD) and 95% confidence intervals (CI). Findings were summarized by menstrual cycle phase (luteal, follicular, or varied) and overall. **Results:** After reviewing more than 1100 articles, mean hormone levels from 2,341 current smokers and 5,588 non-smokers were abstracted from 17 peer-reviewed articles published on or after 1988. A varied number of these 17 articles had data on estradiol (n=16), progesterone (n=9), testosterone (n=5), DHEAS (n=3), DHEA (n=3) and SHBG (n=6). In this group of studies, current smoking was not associated with a significant difference in mean hormone or SHBG concentrations by menstrual cycle phase or over all phases except for DHEA but this was based on luteal



phase data from one study only. **Conclusion:** There is accumulating evidence from analytic epidemiologic studies that smoking is associated with a higher breast cancer risk among premenopausal women. However, preliminary analyses of cross-sectional data on sex hormones and SHBG in healthy premenopausal women suggest that smoking toxicity may not contribute to premenopausal breast carcinogenesis via endocrine disruption pathways. Additional studies are needed to better understand smoking and premenopausal hormones in breast cancer etiology.

FUNDING: Unfunded

PS4-9

ENDS DEVICE TYPE AND SUBSEQUENT USE OF COMBUSTIBLE TOBACCO AND ENDS AMONG TEXAS ADOLESCENTS

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Significance: Past research has examined the impact of ENDS use on the onset and continued use of tobacco products, like cigarettes. This study extends this research to examine whether this impact varies by device type at first ENDS use (Disposable, Cartridge, Refillable). **Methods:** Data were from the Texas Adolescent Tobacco and Marketing Surveillance (TATAMS) study, a longitudinal population-based cohort study of 6th, 8th, and 10th grade students. Eight waves of data were collected every 6 months from 2014-2018. The analysis sample was limited to those who initiated ENDS use across any wave (n=1324; N=151784). Unadjusted logistic regression models assessed the likelihood of (a) initiation of combustible tobacco products and (b) continued (past 30-day) use of combustible tobacco, and (c) continued (past 30-day) use of ENDS, by initial ENDS device type. **Results:** If students' initial ENDS device type was a first generation device such as a Cartridge (OR=0.41; 95% CI=0.17-0.98; p=0.05) or Disposable (OR=0.42; 95% CI=0.19-0.89; p=0.03), participants were significantly less likely to initiate combustible tobacco in a subsequent wave compared to those who started with a Refillable (second generation). Compared to participants initiating ENDS use with a Refillable, participants initiating with a Disposable were more likely to report past 30-day combustible use (OR=2.96; 95% CI=1.03-8.46; p=0.04). Compared to participants initiating ENDS use with a Disposable, participants initiating ENDS use with a Cartridge were less likely to report past 30-day ENDS use at the same or subsequent wave (OR=0.29; 95% CI=0.11-0.76; p=0.01). **Conclusion:** This is the first study to show that the onset and progression in adolescent use of tobacco varies by initial ENDS device type. The results can have major implications given the high number of second-generation ENDS users. The findings can have regulatory implications on sale and usage of ENDS devices and accessories. Considering the surge of ENDS device types with varying strengths and flavors, further research is needed on the impact of device types, accessories, strengths and intensities on tobacco use.

FUNDING: Federal

PS4-10

TACKLING SMOKING AMONG OUT OF SCHOOL YOUTH IN SOUTH AFRICA- AN ANALYSIS OF FRIENDSHIP TIES

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Significance: Friendships during adolescence play a significant role in the initiation and maintenance of tobacco use. Smoking behaviour among adolescent friends has not been explored among out of school youth (OSY) in South Africa. Out of school youth (OSY), described as those between 13-20 years old, have not completed their schooling and are not currently enrolled in school, are at greater risk for tobacco use. The main aim of this study is to examine whether the smoking behaviour of OSY is associated with that of their OSY friends. **Methods:** Respondent driven sampling was used to recruit OSY and their OSY friends. A mixed effects logistic regression with a random intercept across school-province combinations was used to analyse survey data. Race and gender were also incorporated into the analyses as effect moderators (n=391). **Results:** Results of this study confirm that cigarette smoking was common among OSY and their OSY friends, with 53.5% of the respondents smoking in the past month (SD=0.44). When OSY friends were either all non-smokers or half their friends were non-smokers, Coloured (mixed race) OSY were less likely to smoke compared to Black African and Other (mostly Asian descent) OSY. **Conclusion:** Cultural norms and values associated with the different race groups may play a role in the smoking

behaviour of out of school youth friends. Understanding this relationship is useful for identifying those OSY that are vulnerable to the behaviours that place them at risk of tobacco-related morbidity and mortality.

FUNDING: Unfunded; Academic Institution

PS4-11

THE EFFECTIVENESS OF PICTORIAL AND TEXT-ONLY NICOTINE ADDICTION WARNINGS IN E-CIGARETTE ADVERTISEMENTS

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Significance: Research comparing the effectiveness of tobacco pictorial warnings to text-only warnings has largely been done in the context of packaging rather than traditional ads. Warnings on ads are important for e-cigarettes, which are less regularly carried in original packaging. The new FDA Deeming Rule requirements on warning placement and size also have the potential to increase the effectiveness of warnings on ads. We examined the impact of various potential pictorial nicotine addiction warnings embedded in e-cigarette ads on noticeability and e-cigarette use intentions. **Methods:** Participants were 1006 young adults ages 18-29, recruited in January 2019 via Turk-Prime's Prime Panels. Participants were randomized to see one of four different images paired with the same nicotine text warning, or only the nicotine text warning (control), in the context of two different e-cigarette ads. Warnings were located at the top of the ads and sized at 20%. Participants were asked about their intentions to use e-cigarettes in the next 6 months and the warning's perceived noticeability using 5 point scales (not at all-extremely). **Results:** Pictorial warnings did not induce lower intentions to vape compared to the text-only warning (mean 2.38 vs. 2.34, n.s.) and did not produce higher ratings of noticeability (mean 4.05 vs. 4.18, n.s.). However, each of the warnings, including text-only, produced high levels of noticeability, with 76.8% of all participants rating the warning as very or extremely noticeable. In a selection exercise, the warning label was also the ad component most frequently picked as the item that grabbed participants' attention first (58.4%) and the item most likely to be remembered (40.9%). **Conclusions:** Pictorial and text-only warnings had similar impact on intentions to vape, possibly due to the lack of differences in noticeability. Still, high levels of noticeability for the text-only warning may indicate that the newly deemed size and placement of the warnings is effective for garnering attention. Future research should test the impact of a wider range of e-cigarette warning content on e-cigarette intentions and behavior.

FUNDING: Federal; Academic Institution

PS4-12

E-CIGARETTE USE, TOBACCO PRODUCT POLYUSE, AND MOTIVATIONS FOR USE AMONG BALTIMORE YOUNG ADULTS

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Objectives: We examined reasons for e-cigarette use, tobacco product polyuse, and tobacco cessation interest among tobacco-using young adults from an urban setting. **Methods:** Participants (N=97) completed a risk factor survey. Descriptive statistics and prevalence estimates of polytobacco use patterns, motivations for tobacco use, tobacco cessation interest, and beliefs and risk perceptions about tobacco use were calculated overall and stratified by tobacco use statuses. **Results:** All participants had a history of polyuse, and 85% were current polyusers. Stress was the primary reason reported for tobacco use. Compared to single product users, current polyusers were also more likely to mention environment (60% vs. 27%, p=0.024) and cheap cost (45% vs. 0%, p<0.001) as reasons for use. More than half (59%) of participants reported wanting to completely stop using tobacco. While 43% were seriously thinking about quitting smoking within the next 6 months, 49% have tried to quit in the past year. Among current polyusers, those that used e-cigarettes were more likely to report trying to quit tobacco during the past 12 months (67% vs. 36%, p=0.005) and to express interest in enrolling in a quit smoking text messaging program (48% vs. 22%, p=0.010). Most participants perceived cigarettes to be as addictive as cocaine or heroin, although this perception was less common among e-cigarette users than non-users (80% vs. 97%, p=0.037).



Conclusions: Our study demonstrated a high prevalence of polytobacco product use and suggested complex tobacco use patterns among young adults, both in and out of college, from an urban community.

FUNDING: Federal; Academic Institution

PS4-13

EXPOSURE TO HOUSEHOLD AND COMMUNITY SOURCES OF AIR POLLUTION IN A NATIONALLY REPRESENTATIVE SAMPLE: FINDINGS FROM THE NATIONAL ADULT TOBACCO SURVEY OF LAO PDR

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Significance: In Southeast Asia household air pollution (HAP) from solid fuel use is the leading cause of disability-adjusted life years (DALYs), a risk which is compounded by exposure to other sources of indoor and outdoor air pollution including secondhand tobacco smoke (SHS). The purpose of this study was to measure the individual and combined prevalence of exposure to household and community sources of air pollution in a national sample of adults in Lao PDR. **Methods:** We analyzed data from the 2012 National Adult Tobacco Survey (NATSL) of Lao PDR - a multi-stage stratified cluster sample of 9,706 subjects from 2,822 households located in all 17 provinces. **Results:** Our findings indicate a high prevalence of exposure to household air pollution from cooking fires (78%) and SHS exposure in the home (74.5%). More than a third (32.8%) reported exposure to both inside the home. Exposure to outdoor sources of smoke from cooking, trash, and crop fires was substantial (30.1% to 56.0%). **Conclusions:** The aggregation of exposures from multiple sources of household air pollution raises the need for initiatives that establish programmatic linkages in the health, environmental, and agricultural sectors to provide a comprehensive strategy to reduce risk factors for respiratory disease in Lao PDR and the region. [Funding: 5R03TW007345-03, 2R01TW005964-06]

FUNDING: Federal

PS4-14

ESTIMATING RECENT SMOKING-ATTRIBUTABLE FRACTIONS OF CANCER DEATHS AND DISPARITIES ACROSS RACE/ETHNIC, INCOME, EDUCATION AND TEMPORAL STRATA IN U.S. MEN

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SIGNIFICANCE: Cumulative smoke damage's (smoke load's) nearly exclusive roles in lung, and some non-lung (all sites but lung), cancer rate disparities are clear. But smoke load's potential contributions to recent national: temporal; race-ethnic; education, and income-related non-lung cancer mortality disparities have not been studied. So, I studied non-lung cancer/smoke load associations across such disparities in nationally representative United States men aged 25+ years. **METHODS:** I used lung cancer death rates as a smoke load biomarker (predictor). I studied nationally representative U.S. non-lung/lung cancer death age-adjusted rate associations from 2003-2011 using published rates by: a) year from the National Center For Health Statistics (NCHS) (with known biases due to differential census undercounts and proxy-reported decedent age and race), and b) income-, education-, and race-ethnicity per the National Longitudinal Mortality [cohort] Study which lacked those NCHS rates' biases. I used Stata regressions. **RESULTS:** U.S. non-lung cancer deaths/100,000/year rates studied ranged, respectively, from: 138 to 213 (for incomes under 100% versus over 600% of poverty level, respectively); 112 to 255 (for Asian/Pacific Islanders versus American Indian/Alaska Natives, respectively), and 89 to 111 for 2011 versus 2003, nationally. Non-lung/lung cancer rate slopes were 1.2 (95% confidence interval 0.89-1.50, R-squared=0.97) across race-ethnic strata, 0.98 (95% confidence interval 0.70-1.25, R-squared=0.96) across income strata, 0.95 (95% confidence interval -0.48-2.4), R-squared=0.80) across education, and, across the years 2003-2011 with Cochrane-Orcutt adjustment for possible autocorrelation, 0.98 ((0.64 - 1.32), R-squared=0.88) for all men, 0.84 ((0.66 - 1.01), and R-squared=0.95) for non-Hispanic White men, and 1.53 ((1.47 - 1.59), and R-squared=1.0) for non-Hispanic African American men. **CONCLUSION:** Very strong, consistent, dose-response, and biologically plausible, so possibly causal, associations between smoke load and non-lung death rates were seen across the nationally representative disparities and men studied. The associations suggest that smoke load differences may account for 97% of

the race-ethnic disparities, 96% of the income-related disparities, and nearly 100% of the temporal disparities studied. To reduce cancer death rates and disparities in United States men, nearly exclusively focusing on reducing smoke exposures may be merited.

FUNDING: Unfunded; Academic Institution

PS4-15

EFFECTIVENESS OF A WEB BASED INTERVENTION COMPARED TO THE BRIEF INTERVENTION FOR SMOKING CESSATION

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Background: Smoking is the leading preventable cause of death and disease worldwide. Due the high cost of traditional treatments, less costly and effective forms of treatment can help to address the treatment demand. This study evaluates the effectiveness of a computerized intervention compared to the brief intervention for smoking cessation. **Methods:** Participants were from Federal University of Juiz de Fora and were randomly allocated into two interventions: 1) Brief-intervention (BI) or 2) The "Life without Tobacco (LWT)" web-based intervention (www.vivasentabaco.com.br). Participants were contacted to fill in a follow up questionnaire 1- and 3-months after intervention. **Results:** Thirty six smokers were equally allocated into the intervention groups. Most of them were women (55.5%). The mean age was 41.38 years (SD 12.8) and they smoked an average of 15 cigarettes/day (SD 9.28). Twenty seven answered to the first follow up questionnaire (75%). Of these, 3 had stopped smoking (2 LWT x 1 BI) and 15 had reduced the amount of cigarettes/day - 57% reduction on average (6 LWT x 9 BI). Nine participants had not quit smoking (5 LWT x 4 BI). Three months after the intervention, 19 participants answered to the follow up questionnaire (53%). Nine people continued to decrease the amount of cigarettes smoked daily (average reduction of 22%) (5 BI x 4 LWT). Six people did not stop (3 LWT x 3 BI) and one relapsed and return to smoking (LWT). Three people had quit smoking (2 LWT x 1 BI). **Conclusion:** Both interventions were effective for cessation and reduction of consumption. Although the results need to be interpreted with caution because it is a pilot study, they point out that it is feasible to carry out a clinical study to measure the real impact of such interventions.

FUNDING: Academic Institution; Other

PS4-16

USING MACHINE LEARNING TO IDENTIFY FACTORS ASSOCIATED WITH DEPRESSION IN A BRIEF WEB-BASED INTERVENTION FOR SMOKING CESSATION

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Background: Smoking is the leading cause of preventable death and also are associated with depression. Smokers have more comorbidities than non-smokers, being 1.6 times more likely to have a psychiatric disorder as depression. Traditionally, researchers have used multiple regression analysis to find associations, even though new techniques were made available. In this study, we identified factors associated with depression in users of a brief web-based intervention for smoking cessation, using one of the most used machine learning techniques: the C.4.5 algorithm. **Materials and Methods:** The C.4.5 algorithm is a tree structure model that divides the data into smaller portions to identify patterns that can be used to identify associations and for prediction. Data were collected from 236 users from a web-based intervention who agreed to participate in this study and completed the Patient Health Questionnaire (PHQ-2). To find characteristics associated with depression, we used the C.4.5 algorithm for generating a decision tree using nine variables: screening for depression (PHQ-2), age, sex, employment, education, motivation to quit, FTND, cigarettes per day, AUDIT-C, previous quit attempt and number of pages visited. **Results:** Most of the users (64.83%) were depressed. Depression was mainly associated with men - 45.75% of those classified as depressed were men and 72.92% of the men were classified as depressed. Among men, 75.27% of those who visited up to 28 pages of the system were classified as depressed. Among women, 59.29% were depressed. Age is an important feature to identify depression between the women, as 47.06% of those classified as depressed are women older than 33. **Conclusions:** Considering the users from a web-based intervention who agreed to par-



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participate in this study and completed PHQ-2, men were more likely of having depression, and older women were more likely of having depression. Based on these findings, intervention content can be tailored to meet users characteristics.

FUNDING: Academic Institution; Other

PS4-17

ADOLESCENTS' TOBACCO PRODUCT INITIATION BASED ON RACE/ETHNICITY AND SOCIOECONOMIC STATUS

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Significance: Characterizing tobacco product initiation patterns among youth based on key sociodemographic characteristics may help support development of tailored prevention programs. This study aimed to examine how Socioeconomic Status (SES) and race/ethnicity were associated with the first tobacco product tried among adolescent ever-users of tobacco products. **Methods:** Cross-sectional survey data were collected from 6 CT high schools in the Spring of 2019 (N=4875). Ever users of tobacco products [51.7%; 53.6% female, 45.4% non-Hispanic (NH) White, 30.9% Hispanic, 14.9% NH other, 8.8% NH Black, mean age=16.2 years old (SD=1.3)] were asked which was the first tobacco product they tried. SES was assessed using the Family Affluence Scale and categorized into low (34.0%), medium (40.6%), and high (25.4%) SES. A multinomial logistic regression model examined race/ethnicity and SES as predictors of the first tobacco product tried, controlling for sex and age. **Results:** 64.6% of ever tobacco users reported their first tobacco product was an e-cigarette, 24.4% reported blunts, and 11.0% reported another tobacco product. Compared to low SES, middle SES (OR=1.54, 95%CI=1.14-2.09) and high SES (OR=1.59, 95%CI=1.11-2.29) students were more likely to report e-cigarettes as their first tobacco product. Compared to NH White students, NH Black students (OR=0.37, 95%CI=0.22-0.64), Hispanic students (OR=0.41, 95%CI=0.29-0.56) and students of NH other race (OR=0.27, 95%CI=0.19-0.40) were less likely to report initiating with e-cigarettes. Additionally, compared to NH White students, NH Black students were more likely to report using blunts as their first tobacco product (OR=2.98, 95%CI=1.74-5.12). The interaction between race/ethnicity and sex was not significant. **Conclusions:** These findings highlight the need for tailored prevention strategies among youth which account for different tobacco product initiation patterns based on race/ethnicity and SES.

FUNDING: Federal

PS4-18

EXPOSURE AND ENGAGEMENT WITH ONLINE TOBACCO MEDIA AND SUBSEQUENT INITIATION AND CONTINUED USE OF TOBACCO AMONG TEXAS YOUTH: A LONGITUDINAL ANALYSIS

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Significance: Tobacco companies increasingly use online media to recruit the next generation of smokers. This study seeks to address limited research on the impact of tobacco-related online media and youth tobacco use. **Methods:** Data are from 6 waves (Waves 3-8; Fall 2015-Spring 2018) of the Texas Adolescent Tobacco and Marketing Surveillance study, a population-based cohort of middle and high school students (wave 3: n=2,731; N=308,460). Weighted logistic regression models assessed longitudinal associations between self-reported exposure to and engagement with online and social media tobacco messaging at wave 3 and subsequent (waves 4-8) initiation and past 30-day use of combustible tobacco (cigarettes, cigars, hookah), e-cigarettes, and dual/poly use (co-use of any 2+ products). Covariates included gender, school grade, race/ethnicity, sensation seeking and friend tobacco use. **Results:** Among the entire sample, 76% reported exposure; 11% reported engagement. Exposure was greatest for seeing online ads (70%), social media posts (33%), videos (11%), and articles (8%). Engagement was greatest for posting videos or pictures (7%), writing, responding to or reblogging (5%), liking or following brands on social media (4%), and signing up for email alerts (0.1%). Among wave 3 never users of any product (n=2,033), increasing exposure (range: 0-4 forms) was significantly associated with initiating combustible (AOR=1.24; 95% CI=1.02-1.50), e-cigarette (1.37; 1.15-1.63) and dual/poly use (1.32; 1.57-8.48). Higher engagement (0-4) was associated with e-cigarette initiation (1.20; 1.41-2.83) only. Among wave 3 ever users of any product (n=698), higher exposure and engagement were associated with past 30-day use of combustible (1.40; 1.05-

1.87) & (1.58; 1.16-2.15), e-cigarettes (1.56; 1.23-1.98) & (1.73; 1.29-2.31) and dual/poly use (2.07; 1.41-3.04) & (1.56; 1.17-2.06), respectively. **Conclusion:** Exposure to and engagement with online tobacco media are important risk factors for beginning and continuing past 30-day tobacco use among Texas youth. Tougher regulation to prevent youth from seeing and interacting with this content is vital to disrupt the youth e-cigarette epidemic.

FUNDING: Federal

PS4-19

NICOTINE VAPING PRODUCT USE, HARM PERCEPTION AND POLICY SUPPORT AMONG PHARMACY CUSTOMERS IN BRISBANE, AUSTRALIA

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Significance. Despite regulatory barriers for accessing nicotine liquid, use of nicotine vaping products (NVPs) has increased rapidly in Australia. Legal use of NVPs to aid smoking cessation requires a prescription, and pharmacies report receiving enquiries about the use of and access to NVPs. In this study, we assessed NVPs use, harm perception and policy support among community pharmacy customers. **Methods.** A cross-sectional survey was conducted among customers (n=470) from a large community pharmacy chain in Brisbane, Australia. Multivariable logistic regression was used to examine perception of NVPs as less harmful than combustible cigarettes and regulatory recommendations in relation to demographics, smoking status and NVP use. **Results.** Almost one-third of the sample (31%) had either tried NVPs in the past (16%) or were current vapers (15%), the majority of them being current smokers (67%) who are trying to quit (31%) or substitute smoking (41%). Vapers primarily depended on family/friends as a source of information (76%). Current smokers and vapers were more likely to perceive NVPs as less harmful than cigarettes than non-smokers and non-vapers. Perceiving NVPs as safer than cigarettes was correlated with a recommendation to regulate as a tobacco product. **Discussion and Conclusions** There was widespread misperception about relative risk of nicotine-containing products, with 37% of respondents perceiving nicotine-containing NVPs to be as harmful as combustible cigarettes. Community pharmacies represent an ideal setting for educating smokers about smoking and vaping. Thus, pharmacy staff need educational support to ensure that they are equipped to provide current evidence-based information to customers.

FUNDING: Unfunded

PS4-20

SMOKING CESSATION PRACTICES AMONG ETHNIC MINORITIES, A CASE FOR ETHNICALLY TAILORED SMOKING CESSATION SERVICES IN LAGOS STATE, NIGERIA

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SIGNIFICANCE In Nigeria, smoking rates are higher among ethnic groups in the Northern region. Lagos state is the commercial nerve center of Nigeria and the most populous city in Africa, drawing people from various ethnicities seeking economic gain. There is a large group of people of the Hausa ethnicity in Lagos. Some studies have cited higher smoking rates among ethnic minorities, however cessation efforts targeted at ethnic minorities in Nigeria are suboptimal. This study aimed at assessing cessation practices and preferences among smokers in the Hausa community of Idi-Araba in the Mushin district of Lagos State. **METHODS** The was a descriptive cross-sectional community-based study that used a snowball sampling technique to select 157 current cigarette smokers interviewed using pretested Modified version of the Global Adult Tobacco Survey tool. **RESULTS** All the respondents were of the Hausa ethnic group and practiced Islam, 24.1% had either no formal education or Islamic education only, while 38% could neither read nor write. Majority were daily smokers in the lower/lowest socio-economic quintile. More than half (52.9%) had ever tried quitting and were ready to make a quit attempt, primarily for health and economic reasons. Knowledge of the harmful effects of tobacco use was poor and significantly associated with a lower intention to quit. (p<0.05). Only 6.8% had ever received professional help with quitting. Many were more willing to receive and pay for tobacco cessation assistance from a traditional healer rather than a trained health professional. **CONCLUSION** Ethnically



tailored smoking cessation services are needed for this group of smokers. Training of traditional healers to identify and offer ethnically tailored smoking cessation services may be considered.

FUNDING: Unfunded

PS4-21

CONSUMPTION OF SMOKELESS TOBACCO PATTERN OF USE, KNOWLEDGE, & HEALTH AMONG FEMALE GARMENT WORKERS IN URBAN MUMBAI, INDIA

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Introduction: Smokeless tobacco (SLT) use is increasing dramatically among women in India. That has contributed to reproductive health problems among Indian women, particularly among female garment workers with negative consequences on health. Poor socioeconomic conditions, unhygienic living conditions, and lack of knowledge about the hazards of smokeless tobacco use affect the health of women. **Objective:** Therefore, the present study attempt to understand the pattern of smokeless tobacco use, knowledge, and its effects on health in a vulnerable population, such as female garment worker. **Methods:** Mixed method approach chosen for the present study with samples of 450 female garment workers from urban Mumbai city. Ten in-depth interviews conducted using interview guideline. Bi variate analysis carried out on quantitative data. **Results:** The average age of the participant is about 28.04 years with SD ± 4.9 years. The estimated prevalence of SLT use women worker is 53.5%. More than one third reported use of SLT daily. Most women reported the use of five main types of smokeless tobacco: pan with tobacco, mishri, gutkha, chewed tobacco. Most of the current users (89%) wanted to quit SLT immediately and had a less knowledge (47.3%) about the harmful effects of SLT and belief that it is "less harmful" than other types. Among the tobacco users, 89 (76.1%) had reproductive morbidity such as irregular cycles. The association of tobacco consumption with morbidity was statistically significant ($\chi^2=5.413$, $df=1$, $p=0.012$). Around sixty-two percentages of the women workers using tobacco had dysmenorrhea and heavy bleeding problem. **Conclusion:** It is clear from the study that the use of risky and addictive new forms of smokeless tobacco is highly prevalent among garment workers. Immediate intervention programs warranted to reduce the future burden of tobacco use-related morbidity among garment workers exposed to the high pollution levels in garment factories.

FUNDING: Unfunded

PS4-22

RACE, ETHNICITY, PERCEPTIONS OF SOCIOECONOMIC STATUS AND POLY TOBACCO USE

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Purpose: The relationship between socioeconomic status (SES) and tobacco use is well-established. Often overlooked is the subjective perception of SES (SP/SES)—individuals own view of their economic well-being. Research examining SP/SES shows that it may be a better predictor of negative health outcomes than more objective SES measures. The present study examined the relation between SP/SES and tobacco use, including the simultaneous use of multiple products. **Methods:** The study used the Truth Initiative's Young Adult Cohort Wave 1 (2011) data from a nationally representative sample of young adults aged 18-34 ($n=4,215$). Conditional process analyses examined relationships between SP/SES and tobacco use patterns, including cigarette, e-cigarette, non-combustible tobacco and the simultaneous use of multiple tobacco products. Analyses explored the potential moderating effect of race/ethnicity on these associations. All models controlled for age, gender, and household income. **Results:** Combined models found no relationship between SP/SES and patterns of tobacco use. However, moderation models found a significant interaction between SP/SES and race/ethnicity on tobacco use patterns. Hispanic participants who perceived their socioeconomic status as "pretty well off financially" were significantly more likely to report past 30-day use of multiple tobacco products than those who considered themselves financially "average" or "poor," $p < .001$. This interaction was not significant for white, black, other, and 2 or more race/ethnicity participants. **Conclusions:** Among Hispanic participants, higher SP/SES was related to an increased use of multiple tobacco products, even after controlling for household income. Though limited research exists on racial/ethnic differences in dual and poly tobacco use, some evidence shows Hispanic youth may be more likely to be dual or poly tobacco users compared to black youth, and Hispanics report that cultural norms, gender roles and familial factors may influence tobacco use. The fact

that higher SP/SES is related to an increased multiple tobacco product use warrants further investigation into distinct tobacco use patterns, beliefs, and experiences among Hispanic populations.

FUNDING: Federal

PS4-23

ASSESSING NICOTINE WITHDRAWAL IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY: IMPACTS OF TYPES OF USERS AND PRODUCTS USED

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Significance: The PATH Study included a Tobacco Dependence (TD) index that can be used to assess users of different tobacco products. However, the withdrawal syndrome, a core TD symptom, was not similarly reflective of TD across product users. In the current study we used methods based in item response theory and model-based recursive partitioning to identify whether characteristics of product users or product use patterns best identified subgroups with unique tobacco withdrawal symptomatology. **Methods:** Participants were Wave 1 adults ($n=14,869$) with past 30-day Cigarette+E-Cigarette, or Multiple Product users who completed longitudinal assessments. Partitioning of subgroups with Differential Item Functioning (DIF) was based on evaluation of influence from age, sex, racial/ethnic group, and product use. **Results:** Significant DIF ($p's < 0.01$) was identified among nine unique demographic and product use subgroups. Among young adults (18-34) unique patterns of symptoms were reported among Black, Hispanic and White users. Among young adult White men, withdrawal reports differed across exclusive users of E-Cigarette or Cigar products relative to other product users. Among older tobacco users (35+) withdrawal reports differed ($p's < 0.01$) across racial groups and by the products used by White or Hispanic users. Concurrent validation supported relationships between daily use ($b=1.4$, $se=0.08$, $p < 0.01$), TD ($b=0.04$, $se=0.01$, $p < 0.01$) and higher withdrawal scores. Withdrawal scores were highest among Cigarette Only, E-Cigarette+Cigarette, and Multiple Product users. Higher Wave 1 withdrawal symptoms predicted increased likelihood of Wave 2 quit attempts ($RR=1.03$, $95\%CI=1.02-1.04$) and decreased likelihood of 6-month point prevalence abstinence at Wave 2 ($RR=0.88$, $95\%CI=0.79-0.97$) among those who made a quit attempt. **Conclusion:** The PATH Study provided valid assessment of tobacco withdrawal symptoms. Differences across specific age, racial-ethnic and product user groups suggests a need to understand user characteristics when assessing physiological TD symptoms or differential risk for poor cessation outcomes.

FUNDING: Federal

PS4-24

TOBACCO SMOKE EXPOSURE, RESPIRATORY SYMPTOMS, AND HEALTHCARE UTILIZATION AMONG U.S. NONSMOKING ADOLESCENTS

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Significance: The objective was to examine the associations between tobacco smoke exposure (TSE) and respiratory symptoms and healthcare utilization among U.S. nonsmoking adolescents. **Methods:** We conducted a secondary analysis of 2007-2012 National Health and Nutrition Examination Survey data including 2,994 nonsmoking adolescents from 12-17 years old. TSE was assessed using serum cotinine and by self-report on whether the adolescent lived with anyone who smoked tobacco inside the home (i.e., home TSE). Outcome variables included respiratory-related symptoms and healthcare utilization in the past 12 months. We built logistic regression models adjusting for sociodemographics (i.e., adolescent age, sex, race/ethnicity, family monthly poverty level). **Results:** Approximately 7% of nonsmoking adolescents had high TSE (cotinine $\leq 3.00ng/mL$), 35% had low TSE (cotinine $0.05-2.99ng/mL$), and 12% had home TSE. Adolescents with low TSE (adjusted odds ratio [aOR]=1.5, 95% confidence interval [CI]=1.1-2.1) and high TSE (aOR=2.3, 95%CI=1.1-4.8) were more likely to report that wheezing disturbed their sleep than adolescents with no TSE (cotinine $< 0.05ng/mL$). Adolescents with low TSE (aOR=4.0, 95%CI=2.2-7.3) were at increased odds of reporting wheezing limited their usual activities. The low TSE (aOR=2.5, 95%CI=1.7-3.5) and high TSE (aOR=4.0, 95%CI=1.9-8.6) groups were at elevated odds of missing school due to wheezing. Adolescents with home TSE were also at 4.8 increased odds (95%CI=2.9-7.9) to report wheezing disturbed their sleep, and at 1.8 increased odds (95%CI=1.4-2.2) to



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report having a dry cough at night. Adolescents with low TSE (aOR=1.3, 95%CI=1.0-1.7) were at increased odds of having a healthcare visit in the past year, but adolescents with high TSE (aOR=0.5, 95%CI=0.3-0.9) were at reduced odds than adolescents with no TSE. The high TSE group was 2.0 times more likely (95%CI=1.5-2.5) to have an overnight hospital stay than the unexposed group. Conclusion: TSE was distinctively associated with increased respiratory symptoms and healthcare utilization. TSE reduction efforts are critically needed to reduce related symptomatology and healthcare visits.

FUNDING: Federal

PS4-25

PARENTAL INCARCERATION AND YOUTH TOBACCO PRODUCT USE: IMPLICATIONS FOR THE E-CIGARETTE EPIDEMIC AND PREVENTION

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Significance: Youth cigarette smokers have high rates of adverse childhood experiences, and particularly parental incarceration (PI). In Minnesota, 16% of all youth experience PI, but 55% of youth daily smokers experienced PI in 2016. Even though the majority of youth smokers experience PI, no research has examined how PI relates to use of alternative products such as e-cigarettes (e-cigs), which is critical considering the current youth e-cig epidemic. There is also a dearth of research on protective factors that can help to prevent alternative tobacco product use among youth with PI. **Methods:** Data came from the 2016 Minnesota Student Survey. We assessed 30-day use of cigarettes, non-cigarette combustible products, smokeless products, e-cigs, and dual/poly use. We examined use among youth with current, previous, and no PI experience. Using descriptive statistics, logistic regressions, and multiple imputation, we examined adjusted rates of use. We also tested how protective factors including developmental assets, anti-smoking norms, and positive teacher relationships impacted tobacco use according to PI experience. **Results:** Youth with current PI used all tobacco products at higher rates compared to youth with past and no PI experience ($p < .001$). Rates for youth with current PI were: 26% for e-cigs, 21% for dual/poly use, 18% for cigarettes, 17% for combustible non-cigarette products, and 10% for smokeless products. Differences in e-cig use between students with current or previous PI experience and students with no PI experience were the largest differences across all products (26% vs 19% vs 8%, respectively). All protective factors we examined were significantly and negatively related to use of all products, regardless of PI experience. **Conclusions:** Youth with PI experience are at high risk for using multiple tobacco products, and particularly e-cigs. These tobacco-related disparities indicate the current e-cig epidemic is disproportionately occurring among youth with current and previous PI experience. All examined protective factors appear to translate for this population of youth and should be considered in the development of tobacco control strategies.

FUNDING: Federal

PS4-26

FLORIDA YOUTHS' AND YOUNG ADULTS' UNDERSTANDING OF THE CONTINUUM OF HARM OF TOBACCO PRODUCTS

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Significance: Emerging policy from the US Food & Drug Administration (FDA) recognizes that tobacco products fall along a continuum of harm with combustible products being the most harmful, nicotine replacement therapies the least, and non-combustible products falling on a spectrum in between. Past research suggests that youth and young adults do not understand the role of combustion and under- or overestimate the harms of tobacco products and that these misperceptions can vary by tobacco use. **Methods:** In 2017-2018, we recruited 3,537 Florida youth (aged 15-17) and 3,594 Florida young adults (aged 18-24) through social media. Respondents completed an online survey assessing current tobacco use and rated whether smoking cigars, using smokeless tobacco, and vaping were less harmful, about the same, or more harmful than smoking cigarettes. Data were calibrated to state population estimates from the US Census. **Results:** Overall, the majority of respondents identified that cigars were as harmful as cigarettes (67.1%) and vaping was less harmful (52.5%), but only 8.3% reported that smokeless tobacco was less harmful than cigarettes. Current cigarette smokers overestimated the harm of cigar use (31.5% responded "more harmful") more than susceptible never-smokers (19.6%), non-susceptible never smokers (19.9%), and former smokers

(23.9%). Non-susceptible never smokers overestimated the harm of vaping (55.5% responded "same" or "more harmful") more than other groups (range 39.3%-43.4%). The degree of inaccuracy regarding the harms of smokeless tobacco was similar across all smoking status groups (range 89.3%-93.5% responding "same" or "more harmful"). **Conclusions:** Many Florida youth and young adults do not recognize the role of combustion in causing harm. This may indicate misperceptions about the relative risks of tobacco products and what characteristics affect those risks, especially in the case of smokeless tobacco. Health communication from FDA and other sources about a tobacco product continuum of harm should be informed by youths' and young adults' misperceptions to mitigate potential unintended consequences among these groups.

FUNDING: State

PS4-27

EFFECTIVENESS OF E-CIGARETTE INFORMATION MESSAGES

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SIGNIFICANCE: Many researchers believe electronic nicotine delivery systems (ENDS) pose fewer risks than cigarettes; however, ENDS are not harmless. While non-smokers would ideally not use ENDS, smokers could benefit, if they switch completely from smoking to vaping. We explored different approaches to communicating these contrasting yet important messages. **METHODS:** An online survey of 519 New Zealand smokers (n=270 ENDS users) and 486 non-smokers (n= 54 ENDS users) tested two messages with non-smokers (potential health risks of vaping and nicotine addiction), and four messages with smokers (three explaining reduced harm and an addiction message). Non-smokers used a 5-point scale (1=not at all; 5=extremely) to assess each message's effect on concern about ENDS' health risks; motivation not to use ENDS, and belief that ENDS pose similar risks to smoking. Smokers used the same scale to assess concern about smoking's health risks, motivation to switch completely to ENDS, and belief that ENDS pose fewer health risks than cigarettes. **RESULTS:** Following message exposure, non-smokers who did not use ENDS were between four and five times more likely than non-smokers who used ENDS to feel concerned about ENDS, motivated not to use ENDS, and to believe ENDS were as harmful as smoking (ORs ranged from 3.94 to 5.19; $p < 0.001$). By contrast, after exposure to reduced harm messages, smokers who did not use ENDS were significantly less likely than smokers who did use ENDS to report health concerns (ORs ranged from 0.39 to 0.73, $p < .05$ for most). However, smokers who did not use ENDS were more likely to report health concerns and feel motivated not to use ENDS after exposure to the addiction message (ORs 1.75 $p < .05$). **CONCLUSIONS:** On-pack messages about nicotine addiction and health risks of vaping are likely to have more effect on non-ENDS users than on ENDS users, potentially reinforcing non-smokers' decision not to use ENDS, yet encouraging smokers who do not use ENDS to try these devices. However, encouraging ENDS users who smoke to switch fully to ENDS may require stronger interventions than messages.

FUNDING: Federal; Academic Institution

PS4-28

SMOKING AND PSYCHIATRIC CHARACTERISTICS ASSOCIATED WITH INCREASED HISTORY OF SUICIDALITY IN THE EAGLES SAMPLE

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Background: While tobacco smoking is a risk factor for suicide independent of psychiatric illness, no large-scale studies have systematically examined the relationships among suicidality (suicidal ideation and/or behavior), smoking characteristics, and specific psychiatric diagnoses in a group of smokers making a quit attempt. The aim of this secondary analysis was to assess correlates of suicidality among smokers who participated in the EAGLES trial. **Methods:** We utilized baseline data collected from the EAGLES trial (Anthenelli et al., 2016), which evaluated the safety and efficacy of smoking cessation aids in smokers with (Psychiatric Cohort, PC) and without (Non-Psychiatric Cohort, NPC) psychiatric diagnoses. Participants (N = 8,144) were assessed for history of suicidality using the Columbia Suicide Severity Rating Scale. **Results:** Lifetime prevalence of suicidality in the entire sample was 19.9% and was seven times greater in the PC than the NPC (34.7% vs 4.8%). Those with a lifetime history of suicidality were more likely to be female, be enrolled in the US, have more medical and psychiatric comorbidities, have a greater smoking burden, and have a history of primary psychiatric



diagnosis. Stepwise multinomial logistic regression models found six terms positively associated with lifetime suicidality in both the PC and NPC: age, US enrollment site, baseline levels of anxiety and hostility, number of comorbidities, and years smoked (p 's < .0001). The PC model also included four psychiatric/substance use parameters positively associated with suicidality: affective, Post-Traumatic Stress, Bipolar, and Alcohol Use disorders. Conclusions: Smoking chronicity and difficulty quitting, number of medical and psychiatric comorbidities, and higher baseline levels of anxiety and hostility appear related to a lifetime history of suicidality in smokers with and without a history of psychiatric diagnosis. Having specific psychiatric diagnoses amplifies this risk especially among individuals with affective disturbances. These findings highlight the importance of assessing smoking characteristics as a risk factor for suicidality.

FUNDING: Pharmaceutical Industry

PS4-29

SMOKE LOAD'S ASSOCIATIONS WITH THE LARGE, LONG MORTALITY DEFICITS, THEN EXCESSES, AND NOW DEFICITS AGAIN IN OLDER AFRICAN AMERICAN VERSUS WHITE MEN

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Significance: Understanding the large, paradoxical, and repeated reversals in Black/White mortality disparities in older men may offer ways to understand and eliminate their and others' mortality excesses. So I described the 1969-2017 national cancer, natural, and total annual mortality rates (rates) and rate ratios (RRs) for older Black and White men and their relationships to concurrent smoke loads (cumulative smoke damages). Methods: I used: 1. Older (age 85+ years) male national US mortality rates from the National Center For Health Statistics; 2. Lung cancer rates as a sentinel health event/smoke load biomarker; and 3. Race-specific other mortality/lung cancer rate regressions by race. Results: Total and natural mortality rates generally declined 1969-2017 for older Whites and after 2002 for Blacks. But non-stomach (NS) cancers' mortality rates spiked much steeper and longer for Blacks than Whites and helped drive previously low Black/White mortality RRs well over 1.0 for 31 and 4 years across NS cancers and total mortality, respectively. Strong non-lungNS/lung cancer death rate associations across 1969-2017 were seen (slopes 1.46 (95% confidence interval (95%CI) 1.2-1.7, R-squared 0.78) for whites and 3.0 (95%CI 2.7-3.4, R-squared 0.87) for Blacks without, and still statistically significant with adjustment for possible autocorrelation. Conclusion: A higher, longer smoke load epidemic in Blacks likely: drove up their death rates and RRs; caused a greater than previously recognized effect on mortality rates and disparities; and suggests that more emphasis on tobacco control is needed.

FUNDING: Unfunded; Academic Institution

PS4-30

AN ANALYSIS OF FACTORS PROMPTING ENDS UPTAKE AMONG SMOKERS AND NON-SMOKERS

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SIGNIFICANCE: Smokers may reduce the health risks they face if they switch fully from smoking to vaping. Conversely, non-smokers would increase the risks they face if they commenced either smoking or vaping. Understanding factors that promote vaping uptake could support optimal health outcomes among both groups. **METHODS:** We conducted an online survey of 1005 New Zealanders that included 312 current vapers (vaped in the last 30 days; 270 smokers (S) and 54 non-smokers (NS)) using a sample sourced from Dynata, an online panel provider. We used forced choice questions to explore reasons for vaping uptake among current vapers. We then used descriptive analyses and logistic regression models to compare how frequently smokers and non-smokers who currently vape cited each of the reasons tested. **RESULTS:** Irrespective of smoking status, current vapers cited sensory pleasures as the most important reasons for vaping; specifically, many cited liking flavours (83% S; 80% NS (ns)) and enjoying vaping (76% S; 80% NS (ns)) as key reasons for vaping uptake. Vapers also reported finding vaping more affordable than smoking (79% S; 82% NS (ns)). Less than half indicated they started vaping because they were curious (47% S; 48% NS (ns)), and less than a third reported being advised by a health professional to commence vaping. The only significant difference detected was that smokers were significantly less likely than non-smokers to cite reduced health risks as a reason for vaping (72% (S); 87% (NS); OR 0.37; $p < 0.05$). **CONCLUSIONS:** Smokers and non-smokers who used ENDS gave very similar reasons for vaping uptake, citing pleasure, and perceptions vaping is less expensive and less harmful than smoking, as their main motivations for vaping. Non-smokers were more likely than smokers to cite health concerns about smoking

as a reason for vaping. Our findings raise the possibility that measures to reduce the appeal of vaping to non-smokers may affect smokers' transition to vaping; experimental studies are now required to test this possibility.

FUNDING: Federal

PS4-31

IMPACT OF PRICES AND TV ADVERTISING ON E-CIGARETTE SALES - EVIDENCE FROM RETAIL SALES DATA IN THE U.S.

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SIGNIFICANCE: Rapid growth in e-cigarette use in recent years in the U.S. has generated heated debate about the role e-cigarettes play in population health. While some argue e-cigarettes can serve as a substitute for cigarettes, and displace cigarette smoking, many are concerned about the youth e-cigarette epidemic and the long-term consequences of e-cigarette use. This study examines two factors that influence e-cigarette use: e-cigarette prices and televised e-cigarette advertising. In addition, this study investigates to what extent cigarette prices may influence e-cigarette sales. **METHODS:** Quarterly retail sales and price data of cigarettes and e-cigarettes, by retail market, were compiled from 2010-2017 commercial retail scanner data. Quarterly televised e-cigarette advertising, measured by Nielsen TV ratings, for all media markets in the U.S., were compiled from Kantar Media. Market-store and year/quarter fixed-effects models were employed to estimate the impact of e-cigarette prices, separately for reusable e-cigarettes and disposable e-cigarettes, the impact of cigarette prices, and the impact of contemporary e-cigarette TV ratings on e-cigarette sales. **RESULTS:** A 10% increase in e-cigarette price would result in a 16% decrease in sales of reusable e-cigarettes and a 19% decrease in sales of disposable e-cigarettes. A 10% increase in cigarette price would increase the sales of reusable e-cigarettes by 8.7% and increase the sales of disposable e-cigarettes by 9.5%. Contemporary e-cigarette TV advertisements had a positive and significant impact on sales of disposable e-cigarettes, but did not have a significant impact on reusable e-cigarette sales. **CONCLUSION:** The demand for e-cigarettes was sensitive to changes in their own prices. Positive relationship between cigarette price and e-cigarette sales provided the evidence that e-cigarettes were substitutes for cigarettes. Televised e-cigarette advertising likely increased the demand for disposable e-cigarettes. These findings can inform public health policies regulating e-cigarette pricing and advertising in the U.S. **FUNDING:** Research reported in this study was supported by the National Cancer Institute of the National Institutes of Health under Award Number R01CA194681. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

FUNDING: Federal

PS4-32

AN EMPIRICAL EXAMINATION OF AN INTEGRATED MODEL FOR INDIVIDUAL SMOKING CESSATION AMONG CHINESE ADULTS

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Significance: Many behavioral change theories have been proved to be effective in explanation and prediction of quit smoking, but these theories have many repetition and limitations. This study aims to develop and test an integrated model based on the existing theories to providing a guide for future smoking cessation intervention. **Methods:** A narrative review of the relevant literature to theories on individual smoking cessation was applied. An integrated model was developed based on the Theory of Planned Behavior (TPB) and the Health Action Process Approach (HAPA). The model divides the quitting process into three phases following HAPA. A cross-sectional questionnaire survey was conducted from a convenient sample of 708 smokers and quitters from five companies in Shanghai in 2018. There were 405 smokers in the pre-intention phase (have no intention to quit smoking), 158 in the preparation phase (have the intention to quit smoking within one month) and 145 in the action phase (start to quit smoking). The structural equation models (SEM) were only possible to test predictors of intention, and multiple comparisons were applied for post-intention analyses. **Results:** SEM demonstrated a good model fit (SRMR = 0.041, CFI = 0.992) with action self-efficacy directly predicted intention (0.141, $P < 0.001$) as hypotheses and subjective norm predicted intention via attitude towards smoking (subjective norm predicted attitude: -0.726, $P < 0.001$; attitude predicted intention: -0.215, $P < 0.001$). After smokers had the intention to quit smoking, the level of social support, action plan, coping plan, maintenance self-efficacy, recovery



self-efficacy and action control all have no significant changes from the preparation phase to 0-1 month after quitting. Action plan (P1(1-3 months vs preparation phase) <0.001 ; P2(1-3 months vs 0-1 month) $=0.033$), coping plan (P1 $=0.002$; P2 $=0.026$) and action control (P1 <0.001 ; P2 $=0.016$) significantly increased in 1-3 months compared with the preparation phase and 0-1 month after quitting. Maintenance self-efficacy in over 6 months reached significantly highest compared to early times. **Conclusions:** The integrated model can explain the quitting intention among Chinese smokers, a further longitudinal study is required to test the model fit in the preparation and action phases. Smokers may need more help in the pre-intentional phase and within one month after quitting. When quitting for 1-3 months, quitters learn to use more strategies in smoking cessation, and 6 months later, they have more confidence in keeping up quitting.

FUNDING: Academic Institution

PS4-33

A SURVEY OF NEW ZEALAND PHARMACISTS' KNOWLEDGE AND ATTITUDES TOWARDS E-CIGARETTES

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Significance. Despite the lack of evidence in safety and efficacy, e-cigarettes have become increasingly popular in New Zealand. Community pharmacies are one of many retail stores that sell e-cigarettes. We aimed to explore community pharmacists' knowledge and opinions on the use of e-cigarettes in NZ. **Methods.** In mid-2018 we emailed an online cross-sectional survey to ten percent ($n=303$) of community pharmacists randomly sampled from a list of all registered community pharmacies in New Zealand supplied by the Ministry of Health and analysed their responses using descriptive statistics. **Results.** A total of 182 (60%) questionnaires were completed. There was a lack of knowledge about e-cigarettes. Only 9% of pharmacies sold devices; mostly cartridge models; 6% sold flavoured e-liquid. The most common concerns were about safety: 75% ($n=127$) stated that e-cigarettes are safer than smoking. Only 5% ($n=9$) stated they do not cause adverse effects. Most were unaware of the status of regulations surrounding e-cigarettes and felt they were not ready to sell e-cigarettes. **Conclusion.** This is the first study investigating community pharmacists and e-cigarettes in NZ. The uncertainty regarding e-cigarettes can be attributed to a lack of information about safety and efficacy and a lack of clarity about NZ regulations. Although only a minority of pharmacies sell them, e-cigarettes are growing in popularity so it is essential pharmacists have good knowledge to promote the provision of evidence-based counselling to consumers.

FUNDING: Academic Institution

PS4-34

SMOKING AND CESSATION-RELATED ATTITUDES AMONG MEN WHO HAVE SEX WITH MEN IN THE COUNTRY OF GEORGIA

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Significance: Tobacco use is prevalent among men who have sex with men (MSM) and has particularly adverse consequences for those with HIV. We examined smoking-related behaviors and attitudes among participants in the country of Georgia MSM Cohort Study. **Methods:** Established in 2016, the Georgian MSM Cohort includes 608 participants (493 HIV- and 115 HIV+). HIV- MSM were recruited through peer referral in 3 Georgian cities. HIV+ MSM were recruited through the National AIDS Center. We assessed lifetime and past 30-day smoking, cigarettes per day (cpd), time to first cigarette, and importance and confidence regarding quitting (0=not at all to 10=extremely), as well as sociodemographics and other substance use. **Results:** Median age was 26 years, 47% had \leq high school diploma, 32% were unemployed, 79% used alcohol in the past month, and 22% used illicit drugs in the past year. Overall, 74% reported current (past 30-day) smoking (compared to 57% in general male population); among current smokers, 87% smoked daily, mean cpd was 19.8, 65% first smoked within 30 mins of waking, average quitting importance of 6.8, and average confidence of 6.4 (no differences by HIV status). In multivariable analyses, factors associated with current smoking included past month alcohol use (OR=2.52, $p<.001$) and past year illicit drug use (OR=3.98, $p<.001$). Among current smokers, factors associated with smoking more cpd included being >25 years old (OR=2.00, $p<.001$) and smoking within 30 mins of waking (OR=8.29, $p<.001$). Greater quitting importance (score ≥ 7) was associated with having a university education (vs. high school: OR=1.98, $p<.001$; vs. current student/unfinished

education: OR=2.14, $p<.001$) and no other substance use (OR=1.81, $p<.001$). Greater quitting confidence (score ≥ 7) was associated with consuming <20 cpd (OR=2.49, $p<.001$), first smoking after 30 mins of waking (OR=2.54, $p<.001$), and living in rural vs. urban settings (OR=1.68, $p<.001$). **Conclusions:** Two out of three MSM in Georgia are current smokers. Alcohol and drug use are associated with current smoking, as is being >25 years-old. There is an urgent need to develop smoking cessation programs tailored for MSM in Georgia.

FUNDING: Unfunded

PS4-35

EFFECT OF ACTIVE REFERRAL COMBINED WITH A SMALL FINANCIAL INCENTIVE ON SMOKING CESSATION: A CLUSTER-RANDOMIZED CONTROLLED TRIAL

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Significance Smoking cessation (SC) services are effective but depend on smokers who are interested in quitting to seek help. We examined the effect of active referral to SC services plus a small financial incentive to encourage service use, on abstinence in smokers we proactively recruited from community. **Methods** In this two-arm, pragmatic, cluster-randomized controlled trial following CONSORT, 1034 adult daily cigarette smokers (83.2% men) were recruited from and cluster randomized by 65 community sites throughout Hong Kong in 2018. Participants in the control group ($n=485$) received a brief advice to quit and a self-help booklet at baseline. Participants in the intervention group ($n=549$) additionally received an offer of referral to SC services at baseline and an incentive of HK\$300 (US\$38.3) coupon upon usage of the services within 3 months from baseline. The primary outcomes were biochemically validated abstinence (exhaled CO <4 ppm and salivary cotinine $<10\mu\text{g/L}$) at 3 and 6 months. Secondary outcomes included self-reported 7-day point-prevalent abstinence (PPA) and use of SC services at 3 and 6 months. Trial registration: ClinicalTrials.gov: NCT03565796. **Results** At baseline, 69% of the participants were not ready to quit within 30 days. At 3 months, by intention-to-treat, the intervention group had higher biochemically validated abstinence (8.4% vs. 4.3%, $p=0.009$), higher self-reported PPA (17.7% vs 11.6%, $p=0.006$), and higher cumulative use of SC services than the control group (10.6% vs 0.6%, $p<0.001$). The intervention effect on validated abstinence was stronger in participants not ready to quit within 30 days at baseline than those ready to quit (p for interaction <0.001). The 6-month follow up is in progress. **Conclusion** The preliminary results suggest that active referral with a small financial incentive to encourage SC service use was effective in increasing SC service use and abstinence, particularly in unmotivated smokers.

FUNDING: Nonprofit grant funding entity

PS4-36

GENDER VARIATION IN STEREOTYPING SMOKING IN NIGERIA

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Significance: The prevalence of males and females smoking is quite similar in many high-income countries but skewed towards the male gender in middle- and low-income countries like Nigeria. Several studies from Nigeria have reported low prevalence with a National Prevalence of 5.6% while smokeless tobacco use is 1.9% as well as a male preponderance. This may be an advantage if harnessed to control female smoking in Nigeria. This study reports some of the underlying factors for the differences in the smoking prevalence of males and females and gender perception of smoking in Lagos State, South West Nigeria. **Methods:** This was part of a larger population based cross-sectional study in Lagos State Nigeria in which the subjects were selected from the three Senatorial districts of Lagos state in a multistage sampling technique. Data was collected with a structured self-administered or interviewer administered questionnaire, an oral examination and validation of tobacco use with Bedfont Pico smokerlyzer. **Results:** A total of 2445 subjects were interviewed and examined. They were aged between 10 and 86 years with a mean age of 34 (sd 14.29). There were 58.4% males and 42.6% females. Prevalence of ever smoked was 28.55% while prevalence of current smoking was 9.2% of total and 32.25% of ever smoked. Of the current smokers, 57% were males and 43% were females. A significantly higher proportion of the respondents had negative perception of a female smoker (73.14%) than a male smoker (24.92%). While the adolescents were significantly tolerant of male smokers, all age groups were more negative towards the female smoker. Smoking status and gender were not sig-



nificantly different. Conclusion: This result showed that male and female respondents differed significantly in how they viewed the smoking behaviour of males and females in the society. This could be a cultural advantage in curtailing female smoking in Nigeria.

FUNDING: Academic Institution

PS4-37

EXPERIENCES AND PERCEPTIONS OF SMOKING CESSATION STRATEGIES AMONG SMOKERS WITH A GED

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Significance: Cigarette smoking is much higher among individuals with a GED (37%) compared to other education levels (<25%), despite a similar rate of past quit attempts. Using mixed methods, we explored personality traits as well as experiences and perceptions of various smoking cessation strategies to identify potential ways to tailor an intervention in this unique population. **Methods:** We recruited 40 GED smokers aged 18 to 35 who reported a recent quit attempt or intention to quit. Using surveys and interviews, we asked about personality traits, strategies used in previous quit attempts, and opinions of potential strategies they had not tried (i.e. nicotine replacement therapy [NRT], counseling, quitline, online program). We explored other factors that could help with quitting (i.e. advice, family or friends quitting, raising costs, financial incentives). Interviews were audio-recorded, transcribed, and coded by two investigators until reaching agreement. Codes were analyzed for themes. **Results:** Many GED smokers reported high impulsivity, often with early experimentation with various tobacco products, alcohol, and other drugs. They reported difficulty paying attention and staying focused, transitioned from job to job looking to earn more money, and often questioned authority. Based on survey results, 48% of GED smokers had ever used NRT and 25% had ever used pharmacotherapy. Among those who had tried quitting in the past 12 months, 58% used e-cigarettes to try to quit. When asked about potential strategies, the majority were uninterested in NRT or counseling because of previous negative experiences or the perception either would be ineffective or uncomfortable. GED smokers believed quitting was something they should and could do on their own. Many thought higher prices of cigarettes would help them quit for good, and nearly all were confident financial incentives would be highly effective, although some did think it might depend on how much money was offered. **Conclusion:** Financial incentives may be highly motivating and more effective among GED smokers, who have negative or mixed feelings about more traditional cessation strategies such as NRT or counseling.

FUNDING: Federal

PS4-38

ADOLESCENTS VIEWS ON TOBACCO BAN AND LEGISLATION

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SIGNIFICANCE Tobacco use is a common habit that develops while growing especially among adolescents. Adolescence is a period to develop, grow and experiment. Most adult smokers begin during their adolescent years and the addiction becomes difficult to quit. Therefore, assessment of their views on tobacco legislation is important prior to implementation of policies to curb its use. This study therefore was aimed at determining the views of adolescents about tobacco products, its ban and legislation. **METHODOLOGY** A community based cross-sectional study among adolescents aged 10 - 19 years residing in Surulere Local Government Area (LGA), Lagos, Nigeria. A multi-stage sampling technique was employed to recruit adolescents into this study. Four wards were randomly selected from the 12 wards in Surulere LGA. Two streets were then randomly selected from each of the 4 wards. Twenty streets were randomly selected in each street. One household was selected in each house and all adolescents in the household was recruited into the study. Interviewer administered questionnaires were used to collect socio-demographic data, knowledge, attitude and practices of tobacco use of each adolescent. **RESULT** A total of 305 questionnaires were administered giving a response rate of 93.8%. The mean age of the respondents is 15.23 ± 2.2. Majority had never smoked before (88.2%) compared to (11.8%) who had ever used tobacco products with the age of first use at between 15-16 years. There was a statistically significant association between tobacco use and gender (p less than 0.05) Most respondents strongly agree that there should be a ban of sale of tobacco to adolescents (51.2%), price increase (34.1%), ban of advertisements of tobacco products and prohibition of smoking in public places (58.9%). Females had a more significantly positive attitude to banning of tobacco products in Nigeria compared to males. **CONCLUSION** This

study showed that most of the respondents have a positive attitude towards the ban of tobacco, its advertisements and prohibition of smoking in public places. This suggests that Smoke free legislation might also be an effective strategy to reduce tobacco use among adolescents in Nigeria.

FUNDING: Unfunded; Other

PS4-39

THE IMPACT OF AGE AT SMOKING INITIATION ON PREVALENCE OF MULTIPLE HEALTH BEHAVIORS AMONG US ADULTS

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Introduction In the USA, more than 3,200 children or adolescents start smoking cigarettes every day and become addicted to nicotine. Early smoking initiation is associated with many adverse health outcomes (e.g., increased cardiovascular and pulmonary diseases, cancers as well as premature deaths). The underlying mechanisms may be related to smoking serving as a gateway to engaging in other risky behaviors. However, the literature has not been examined such association. This study was aimed to examine the association between smoking initiation and the prevalence of multiple health behaviors using a nationally representative sample of US adults. **Methods** National Health Interview Survey (NHIS) data from 2006 through 2015 were analyzed. The primary predictor was the age of smoking initiation: starting to smoke 1) before the age of 16 years, 2) at age between 16 and 18 years, or 3) after the age of 19 years or later). The dependent variable was whether or not engaging in other risk health behaviors (heavy drinking, physical inactivity, and weight risk). Confounding variables included demographics and socio-economic status. The analyses included U.S. residents who were 30 years old and older (N=155,733, Population Estimate: 125 million) and had a history of smoking. Statistical analyses relied on multinomial logistic regression models. **Results** Among the U.S. population of current or former smokers (≥30 years old), 18.3% started smoking before age 16, 49.7% at ages 16-18, 32.1% at ages 19 or later. Early smoking initiation was associated with high prevalence of multiple health behaviors. Individuals who started smoking before age 16 were more likely to engage in one additional risk behavior (OR = 1.12; p < 0.0001) and two additional health behaviors (OR = 1.25; p < 0.0001) and all three health behaviors (OR = 1.48; p < 0.0001), compared to those who started smoking after age 19. **Conclusions** Early smoking initiation was associated with high prevalence of multiple health behaviors, while controlling for a number of covariates, such as demographics and socioeconomic status. Such findings may provide evidence that early smoking initiation serves as a gateway to multiple health behaviors later in life, which then leads to high morbidities and mortalities. Comprehensive tobacco control programs to prevent early smoking initiation among adolescents can reduce the prevalence of multiple health behaviors and promote public health in the US.

FUNDING: Unfunded

PS4-41

NEAR UBIQUITOUS MENTHOL USE AMONG SMOKERS WITH OPIOID USE DISORDER

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Significance: Persons with opioid use disorder (OUD) face multiple barriers to smoking cessation and have low cessation rates compared to smokers without OUD. Lower cessation rates are also associated with smoking menthol cigarettes, which are disproportionately marketed to and over-represented among racial/ethnic minority communities. Previous studies have identified high rates of menthol cigarette smoking among persons with substance use disorders. However, little is known about menthol cigarette use among smokers with OUD specifically. Our objective was to characterize menthol use among urban smokers with OUD receiving methadone maintenance treatment. **Methods:** Participants were persons with OUD in methadone maintenance treatment in the Bronx, NY, screened for inclusion in an ongoing smoking cessation clinical trial. Participants were recruited primarily through staff referral. We examined use of menthol cigarettes, and describe tobacco use behavior among menthol smokers with OUD. **Results:** Of 158 individuals screened, 151 (95.6%) were current smokers, of whom 140 (92.7%) used and 10 (6.6%) did not use menthol cigarettes. Participants who used menthol cigarettes had a median age of 53.3 years, 49.3% were Black and 47.1% were Latinx. Menthol smokers smoked a mean of 13.3 cigarettes per day and 97.9% reported interest in quitting in the next 30 days. Use of evidence based smoking cessation treatments over the prior 30 days was low: 2.9% reported use of varenicline, 4.3% bupropion, 11.4% nicotine patches, 15.7% nicotine gum, and 2.1% nicotine loz-



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enges. Conclusions: Menthol cigarette use is nearly ubiquitous among persons with OUD. We observed a rate of menthol smoking higher than that seen even among U.S. Black and Latinx smokers who face a disproportionate burden of menthol cigarette use. Menthol smokers with OUD report high interest in quitting, but low use of evidence-based smoking cessation treatments. As menthol cigarette smoking is associated with lower cessation rates overall, it is important to understand how menthol cigarettes may increase tobacco-related morbidity.

FUNDING: Federal

PS4-42

PASSIVE EXPOSURE TO AEROSOL FROM E-CIGARETTES IN INDOOR SETTINGS AMONG ADULTS IN 12 EUROPEAN COUNTRIES

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Significance: Exposure to secondhand aerosol from e-cigarette (SHA) may pose harmful effects to bystanders. This study aims to investigate the prevalence, intensity, and determinants of daily SHA exposure in various indoor settings in 12 European countries. **Methods:** In 2017-2018, we conducted a cross-sectional study, the TackSHS survey, on a representative sample of the population aged ≥ 15 years in 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania, and Spain). We described the prevalence and intensity of exposure to SHA in several indoor settings among 11,604 e-cigarette non-users. Individual- and country-level characteristics associated with SHA exposure were also explored using multiple, multi-level logistic regression analyses. **Results:** Overall, 16.0% of e-cigarette non-users were daily exposed to SHA in any indoor setting, ranging from 4.3% in Spain to 29.6% in England. The median duration of SHA exposure was 43 minutes/day. "Other indoor settings" (e.g. bar, restaurant) was reported as the place where most of e-cigarette non-users have been exposed (8.3%), followed by workplace (6.4%), home (5.8%), public transportation (3.5%), and private transportation (2.7%). SHA exposure was more likely to occur in certain groups of non-users, including men, younger age groups, e-cigarette past users, current smokers, those perceiving SHA harmless, and lived in countries with a higher e-cigarette use prevalence. **Conclusions:** This study found disparities of SHA exposure across and within European countries. Governments should consider extending their tobacco smoke-free legislation to e-cigarettes to protect bystanders, particularly vulnerable populations such as youths.

FUNDING: Nonprofit grant funding entity

PS4-43

TOBACCO USE AMONG PREGNANT WOMEN - SECONDARY DATA ANALYSIS FROM THE DEMOGRAPHIC AND HEALTH SURVEYS IN 42 LOW AND MIDDLE INCOME COUNTRIES AND SUB GROUP ANALYSIS OF SOUTH EAST ASIA REGION AND AFRICA

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Objective: To estimate and compare the most recent prevalence rates of tobacco use between pregnant women and women of the reproductive age group in low and middle-income countries (LMICs) and in Africa and South-East Asia Region (SEAR). **Method:** We used the Demographic and Health Surveys (DHS) data from 42 LMICs between the years 2010-2016. Prevalence estimates are generated for exclusive smoking, smokeless tobacco (SLT) use and dual-use for women of reproductive age group and pregnant women and multinomial regression analysis to compare the use of tobacco use among both groups of women while adjusting for age, education, type of residence and combined wealth index. **Results:** Prevalence of exclusive smoking among women of reproductive age group is 1.20% (95% CI 0.96-1.46) and among those who are pregnant is 0.69% (95% CI 0.51-0.90) and that of exclusive SLT use is 0.86% (95% CI 0.53-1.27) and 0.56% (95% CI 0.33-0.84), respectively. Prevalence in SEAR among pregnant women and women of reproductive age group, for exclusive smoking, is 1.81 (95% CI of 0.61-3.61) and 2.93 (95% CI of 1.28-5.22) and that for exclusive SLT is 0.45 (95% CI of 0.2-2.29) and 1.04 (95% CI of 0-3.79), respectively. Similarly, prevalence in Africa, among pregnant women and women of reproductive age group, for exclusive smoking is 0.49 (95% CI of 0.27-0.75) and 0.72 (95% CI of .41-1.10) and that for exclusive SLT is 0.57 (95% CI of 0.31-0.91) and 0.87 (95% CI of 0.51-1.33), respectively. The relative risk ratio (RRR) for exclusive smoking and exclusive SLT use among pregnant women when compared to non-pregnant women is 0.85 (95% CI of

0.67-1.09) and 0.81 (95% CI of 0.67 - 1.00) respectively. In SEAR, the RRR of exclusive smoking is 0.88 (95% CI of 0.73-1.05) and exclusive SLT is 1.07 (95% CI of 1.02-1.12) among pregnant women when compared to non-pregnant women. Similarly, in Africa, the RRR is 0.77 (0.63-0.95) and 0.88 (95% CI of 0.76-1.03), respectively. **Conclusion:** The prevalence does not statistically differ among both groups of women. However, in SEAR there is statistically significant higher use of smokeless tobacco among pregnant women. Therefore, it is important to intervene and increase awareness for pregnant women regarding tobacco use in LMICs.

FUNDING: Unfunded

PS4-44

SEXUAL AND GENDER MINORITIES SPEAK; A COMMUNITY MIXED METHODS EVALUATION OF TOBACCO QUITLINES

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Significance: Sexual and gender minorities (SGM) are a health disparity group with tobacco use prevalence exceeding the national rate. Telephone quitlines (QL) are widely available for free and effective cessation coaching, medications and online programs. Previous research suggests SGM have lower intent to use QL for cessation, but many do access QL during a quit attempt. The barriers to QL access and engagement are not well understood. Evaluating community perceptions and the experience of participants can improve QL care for SGM. **Method:** National Jewish Health, a QL operator in 16 states, and LGBT HealthLink partnered on a mixed methods evaluation of SGM perceptions and experience of QL services. A mixed methods online survey of SGM-identified QL participants (n=232) who enrolled between March 2018 through June 2019 assessed satisfaction with QL services, and how welcoming services are for SGM. Additional qualitative data were collected with SGM who had not used QL (n=12) and with current or past QL participants (n=18) to explore facilitators and barriers to QL access and engagement. **Results:** SGM survey respondents had a mean age of 42, were cisgender (97%), White (76%), and college-educated (61%). Respondents perceived the QL as very welcoming for SGM, particularly online services, while satisfaction was highest with free medication and telephone coaching. Two-thirds felt it was important for QL to know their SGM identity and 94% would recommend the QL to other SGM. Qualitative data from non-QL users highlighted factors in the social environment surrounding SGM and lack of QL awareness as primary access barriers, and suggested targeted QL promotion and connecting tobacco to other SGM health issues. QL users identified QL as a safe and positive environment for SGM that supported motivation, accountability, and self-efficacy during a quit attempt. QL users recommended explicitly connecting SGM stressors and tobacco use, staff cultural training, and more intensive cessation services. **Conclusion:** QL are an important resource to facilitate cessation for SGM and address tobacco disparities. States should target QL promotion tailored to SGM, and QL staff should more explicitly address SGM stressors during cessation coaching.

FUNDING: Unfunded

PS4-45

TOBACCO AND ELECTRONIC CIGARETTE DUAL USE AMONG AFRICAN AMERICAN QUITLINE ENROLLEES

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SIGNIFICANCE: Research suggests that African American adults may be particularly vulnerable to dual use of both tobacco cigarettes and electronic (e)-cigarettes. No previous research has investigated psychosocial risk factors for dual use among in this group. This study was the first to test associations between two hallmark psychosocial smoking risk factors - depressive symptoms and perceived stress - and dual use among African Americans. **METHODS:** Participants (N = 641) were drawn from a 3-arm semi-pragmatic randomized controlled trial (RCT) testing the effects of a culturally specific tobacco cessation intervention among African American smokers enrolled in the North Carolina Tobacco Quitline. At baseline, participants reported demographics and completed measures of depressive symptoms (Patient Health Questionnaire - 2; PHQ2) and perceived stress (Perceived Stress Scale-Brief). Past 30-day e-cigarette use was also assessed (yes or no). Hierarchical logistic regression models (controlling for demographics) tested depressive symptoms and perceived stress separately, and then in a single model testing their covariation. **RESULTS:** Participants were mostly female, single, completed at least 12 years of education, middle-aged, and low-income. The overall prevalence of past 30-day e-cigarette use was 8.3%. When tested separately, depressive symptoms were positively associated with past 30-day e-cigarette use (OR = 1.02, CI: 1.005-1.04, p = .03). There was no association between perceived stress



and e-cigarette use ($p = .64$). Controlling for the covariation between depressive symptoms and perceived stress, only depressive symptoms were independently related to e-cigarette use (OR = 1.02, CI: 1.003-1.04, $p = .03$). Disaggregating items on the PHQ2, current anhedonia was positively associated with e-cigarette use (OR = 1.02, CI: 1.004-1.04, $p = .03$), while depressed mood was not ($p = .80$). **CONCLUSIONS:** Symptoms of current depression capture increased psychosocial risk of dual use among African American tobacco treatment-seekers, particularly feelings of anhedonia. More research is needed to understand cigarette and e-cigarette use in this population.

FUNDING: Nonprofit grant funding entity

PS4-46

AGE AS A PREDICTOR OF QUIT ATTEMPTS AND QUIT SUCCESS IN SMOKING CESSATION. FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL (ITC) FOUR COUNTRY SURVEY

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Significance: Past research has found that young smokers are more likely to make quit attempts, but findings on quit success by age are mixed. This study examined the degree to which smoker age is related to making quit attempts and quit success in the large longitudinal International Tobacco Control (ITC) Four Country Study (United States, Canada, United Kingdom, Australia) over 9 survey waves from 2002 to 2013-15.

Methods: We combined 9 wave-to-wave transitions with predictors at the first wave predicting quit attempts by the next wave and quit success (defined as ≥ 28 days abstinence, confirmed if possible on a third wave for recent attempts). This resulted in data from 15,874 unique smokers aged 18 and above. Age was categorized (18-24, 25-39, 40-54, 55+). Other variables in the predictive model were demographics (employment, relationship status, income, country, education), the Heaviness of Smoking Index (HSI) and intention to quit. **Results:** Younger people are more likely to be non-daily smokers compared to older smokers. Daily smokers were both less likely to report quit attempts. Among those trying, daily smokers were less likely to achieve 28 days of abstinence. Subsequent analyses were restricted to daily smokers. Using 24,202 transitions, those under 25 were more likely to make quit attempts and this persisted after controlling for HSI, although the difference between the 18-25 group and those 55 and older became increasingly slight when intention was included. Among 9,949 quit attempts with resolved outcomes, 56.8% were maintained for at least 28 days. Smokers younger than 25 were more likely to succeed for at least 28 days, but this was only significant when compared to those aged 40-54 (0.74; CIs 0.58-0.95). However, when controlling for HSI the age effect disappeared. **Conclusions:** Young smokers are more likely to attempt to quit. While we found young smokers also more likely to succeed for at least 28 days, this appears to be because they are less dependent and the effect largely disappears when controlling for HSI. It may be important to control for age and heaviness of smoking in studies of predictors of smoking cessation.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PS4-47

YOUTH USE OF E-CIGARETTES IN THE UNITED STATES: DIFFERENCES IN USER CHARACTERISTICS BY DEVICE TYPE

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Significance: Youth e-cigarette (EC) use has nearly doubled in the last two years. There is a significant lack of research examining youth use of specific EC device types (JUUL, other pod-mod, and tank) and how device type is associated with use. **Methods:** A US sample of youth ever EC users (N = 509; 49% male; 70% high schoolers) completed an online survey, including demographic information, history of EC use and

dependence (Hooked on Nicotine Checklist [HONC]), perceived harm, and normative perceptions. Associations between device type, demographic, and user characteristics were examined among current (daily, weekly or monthly) users (n = 206; JUUL 58%; other pod-mod 18%; tank 24%) via chi-square tests and bivariate multinomial logistic regression models. Data were weighted to be nationally representative of the US youth population. **Results:** JUUL users were more likely to be younger ($p < .05$) and male ($< .05$). Tank users were more likely to be Hispanic/Latinx ($p < .05$). Daily use was most common among JUUL users and JUUL users also had higher average HONC scores (M=4.3) compared to tank users (M=2.6; $p < .05$) but not other pod-mod users (M=3.9; $p = .07$). JUUL and tank users were significantly more likely to have initiated use with their current product compared to other pod-mod users (13%; $p < .05$). Normative perceptions of EC was high, with 53% of youth believing most of their friends would approve of their EC use. Perception of harm varied by EC product used; 50% of JUUL users perceived JUUL as not harmful compared to 33% of other EC users. **Conclusions:** Daily use and nicotine dependence were more common among JUUL and pod users compared to tank users. These findings are concerning and potentially due to high concentrations of nicotine often found in JUUL and other pod devices. Findings also highlight the normalization of EC use among youth. Further research and longitudinal studies are needed to continue to monitor patterns of EC use among youth.

FUNDING: Unfunded; Federal; State; Academic Institution

PS4-48

LEARNINGS FROM 'LET'S KICK BUTT 2017', AN INCENTIVISED MASS QUIT SMOKING CHALLENGE FOR MENTAL HEALTH AND ADDICTION PATIENTS

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Significance: Smoking is common in people with mental illnesses. Innovative solutions need to be trialled to increase engagement and reduce smoking in this population group. The 12-week Let's Kick Butt 2017 (LKB 2017) challenge was one such solution piloted by the Auckland and Waitemata District Health Boards in New Zealand during mid-2017 to assist smokers to quit or cut down smoking. LKB 2017 utilised a tailored smoking cessation intervention involving Group-Based Therapy with financial incentives for quitting, delivered under the Motivational Interviewing framework with a harm reduction approach. We sought to measure and understand program implementation fidelity, the level of client engagement, reduction in smoking and smoking cessation and the influence of motivational tools on the outcomes. **Methods:** We analysed attendance data and outcomes data (the number who quit or significantly reduced smoking at the end of the challenge and changes in their exhaled breath carbon monoxide (CO) reading. Qualitative data collected through client focus groups and key stakeholder interviews provided insights into the programme and its implementation, client engagement, acceptance and satisfaction and the influence of different motivational tools on outcomes. **Results:** The programme was largely implemented as intended. Client engagement and acceptance was high (80%); clients considered that the intervention was personally useful and culturally appropriate. At the end of the programme, 68 of the 82 (83%) registered clients completed the challenge. The cessation rate of 36% (20 of 68) was high, compared with quit rates found in trials in the general population. Of the 48 people who did not quit, 29 (60%) were smoking fewer than 5 cigarettes a day, compared to 6-20 cigarettes a day at the beginning of the challenge. **Conclusions:** A group approach, when combined with a range of motivational tools, helped increase engagement and reduce smoking in people with mental illnesses. Strengths of the evaluation included its formative nature, which allowed programme modifications along the way to achieve desired results.

FUNDING: Academic Institution

PS4-49

CHANGES IN MOTIVES FOR AND ATTITUDES TOWARD ENDS USE IN DUAL CIGARETTE/ENDS USERS OVER 12 MONTHS

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Significance: Understanding how motives and attitudes towards ENDS relate to changes in cigarette smoking among users of both cigarettes and ENDS may help guide messaging to reduce cigarette use. The study examined motives for ENDS use over 12 months and their association with cigarette and ENDS cessation. **Methods:** Adult cigarette smokers who also used ENDS participated in a longitudinal observational study. Data come from baseline and 12-month questionnaires. Motives for ENDS use were assessed with 4-point Likert scales, tapping factors of ENDS dependence; perceived safety; use for reduction of cigarettes; appeal (taste, flavor, aesthetics); and social factors.



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Participants (N=323; 59% male) averaged 35 years old (18-70); 40% White, 33% Black, 12% Asian, 11% Hispanic, and 4% other racial/ethnic groups. **Results:** At 12-months, 17% of participants quit smoking cigarettes (no use for 30 days); 26% reduced smoking by > half; 26% reduced smoking by < half, and 30% maintained or increased their smoking rate. For ENDS use, 23% of participants quit using ENDS; 22% reduced ENDS use by > half; 13% reduced ENDS use by < half; and 41% maintained or increased their ENDS rate. Participants who were cigarette abstinent at 12 months, compared to those who did not change their smoking, had significantly stronger baseline beliefs about the appeal of ENDS ($F = 3.74, p < .01$), the use of ENDS for smoking reduction ($F = 2.54, p = .05$), and social facilitation beliefs ($F = 5.51, p < .001$). There were no differences in beliefs about safety. Participants who quit ENDS completely at 12 months, compared to those who maintained use, had significantly lower baseline beliefs about the appeal of ENDS, and their motives decreased significantly over time. Attitudes and motives towards ENDS differed significantly by age, with younger participants (<30) endorsing more favorable ENDS motives and attitudes than older participants (>30). **Conclusions:** Motives and attitudes for ENDS use predict change in use of cigarettes and ENDS, with appeal and social factors for ENDS use most predictive of cigarette cessation. Increasing these motives for use may facilitate use of ENDS for cigarette cessation.

FUNDING: Federal

PS4-50

HOOKAH USE AND ACCULTURATION AMONG NON-US BORN COLLEGE STUDENTS IN NEW YORK CITY

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Significance: Hookah use, which was predominantly a pastime in the Middle East has become a trendy behavior among young adults in the United States. Studies evaluating the impact of acculturation on hookah use among non-US born college students are scarce. **Methods:** We conducted a cross-sectional survey of a diverse population of students attending a large urban public university in New York City to examine the relationship between measures of acculturation and hookah use. The survey was administered to a random sample of degree-seeking students in 2015 on tobacco use (including alternative forms of tobacco use) and health behaviors. The analysis was restricted to students not born in the US (N=1,069). Years lived in NYC and age when migrated into the US were used as proxy measures for acculturation. Logistic regression models were used to examine measures of acculturation associated with hookah use. Odds ratios and 95% confidence intervals were reported. **Results:** In this sample, students from the Caribbean and South and Central Asia had the highest prevalence of current and ever hookah use, respectively. Students from East Asia had the lowest odds of ever and current hookah use. After adjustment for confounders, students who lived in NYC for 9 years or more had an increased odds of ever and current hookah use [OR: 1.9; 95% CI (1.2, 3.0) and OR: 2.4; 95% CI (1.5, 3.9), respectively] compared to students who lived in NYC for less than 9 years. Students who migrated to the US at 13 years of age or older had a decreased odds of ever and current hookah use [OR: 0.5; 95% CI (0.3, 0.8) and OR: 0.3; 95% CI (0.2, 0.6), respectively] compared to students who migrated younger than 13 years of age. **Conclusion:** College students who were more acculturated were more likely to use hookah. Hookah use may be becoming integrated into the US college culture. Future studies are warranted to further understand the role of acculturation on hookah use and risk-taking behaviors among non-US born young adults.

FUNDING: Federal

PS4-51

FACTORS ASSOCIATED WITH INCREASED RISK OF VAPE USE AMONG LATINO YOUTH IN COLORADO

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Significance: Vaping among adolescents is becoming an epidemic, with Colorado leading national vape use rates. Latino youth may be at increased risk for vape use initiation due to social factors. This study seeks to identify factors that increase the risk of vape use among Latino youth in Colorado. **Methods:** Data were analyzed from 8,601 Latino and 14,668 non-Latino students aged 12 to 18+ years participating in the 2017 Healthy Colorado Kids Survey. Variables included: gender (male/female), grade (9/10/11/12/Ungraded), vape use (none/light/heavy), tobacco use (none/light/heavy), marijuana use (non/light/heavy), binary alcohol use, communication with parent (YES/yes/NO/NO!), and household tobacco behaviors (smoke inside home 0-7 days). We calculated

odds ratios and 95% confidence intervals using 2 multinomial logistic regression models to evaluate associations between behavioral and parental factors on vape use and compared the odds ratios of Latinos and non-Latino youth. **Results:** Among Latinos, 18.98% reported light and 7.22% reported heavy vape use; among non-Latinos, 17.31% reported light and 10.4% reported heavy vape use. Both Latino and non-Latino males reported heavier vape use while only Latino males showed increased odds of light vape use compared to females. Students who reported tobacco, marijuana, and/or alcohol use had a greater odds of vape use, regardless of ethnicity. However, Latinos who reported tobacco use had greater odds of vape use, compared to non-Latinos (Non-Latinos OR:5.05 CI:3.39-7.54 $p < 0.05$; Latinos OR:10.01 CI:5.85-17.16 $p < 0.05$). Parental factors appeared to have the most influence on Latino students. Latino students who could not ask their parents for help had a 2.79 (CI:1.82-4.29; $p < 0.05$) greater odds of being a heavy vape user. Additionally, Latino students living in homes with cigarette smoking showed increasing odds of being a heavy vape user as daily exposure to cigarette smoking increases (ORs:4.50, 11.86, 19.87, and 10.28; $p < 0.05$). **Conclusion:** Concurrent tobacco, marijuana, and alcohol use is associated with significantly higher odds of both light and heavy vaping among Latino and non-Latino students. Parental relationships and tobacco behaviors also appear to be influential factors, especially for Latinos. Vape prevention and treatment should target all high school students, particularly Latino male youth, and especially those with concurrent risky behaviors, low perceived parental support, and smoking within the home.

FUNDING: Academic Institution

PS4-52

BARRIERS TO TOBACCO CESSATION BY SEXUAL ORIENTATION AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF TOBACCO USERS

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Significance: Subpopulations of sexual minorities—particularly lesbian and bisexual women—use tobacco at higher rates than their heterosexual peers. Evidence-based biopsychosocial interventions for tobacco cessation are available; however, research is lacking on the specific barriers to tobacco cessation. The purpose of this study is to describe the psychological, normative, and environmental barriers that disproportionately impact sexual-minority (SM) tobacco users. **Methods:** Data from wave 1 of the Population Assessment of Tobacco and Health was used to explore differences by sexual identity across psychosocial barriers and facilitators of tobacco cessation. The analytic sample (N=13,856; SM=939) consisted of current tobacco users (including cigarettes, e-cigarettes, cigars, cigarillos, pipes, hookah, dissolvable snus, and smokeless products). The psychosocial barriers/facilitators were modeled as outcomes in regression analyses, which controlled for age, race/ethnicity, poverty, education, census region, and urbanicity and were stratified by sex. Odds ratios were adjusted for the complex study design and nonresponse. **Results:** Severe behavioral problems were more common among gay/bisexual men; Bisexual, but not lesbian women, had higher odds of severe substance use problems as well as internalizing/externalizing behaviors. Bisexual men and women reported less normative pressure to quit than their heterosexual peers (no differences in gay/lesbian tobacco users). Gay men had more environmental barriers to quit, being more likely to receive tobacco promotion materials and live with another tobacco user. **Conclusion:** Several barriers to tobacco cessation were identified as disproportionately impacting SM participants; however, there were considerable differences between SM men and women, as well as between gay and bisexual participants.

PS4-53

SEMI-PERSONALIZED INSTANT MESSAGING PLUS NICOTINE REPLACEMENT THERAPY SAMPLING (NRT-S) TO PROMOTE SMOKING CESSATION FOR COMMUNITY ADULT SMOKERS: A PILOT RANDOMIZED CONTROLLED TRIAL

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Significance: Mobile phone-based smoking cessation (SC) intervention via text messaging increases abstinence rate. We investigated the effect of semi-personalized instant messaging (IM) support in promoting NRT-S, quit attempt and abstinence. **Methods:** In this two-arm, parallel, single-blinded, pilot randomized controlled trial following CONSORT, 119 daily cigarette adult smokers were proactively recruited from community settings during Dec 2017 to Mar 2018 in Hong Kong. At baseline,



all participants received brief advice on SC, one-week dosage of NRT-S (gum, patch or lozenge) and were actively referred to cessation services. The intervention group (n=62) further received three months of semi-personalized IM (e.g. WhatsApp) support guided by the behavioral change technique of motivational interviewing. The control group (n=57) received general SC messages via Short Messaging Service. The primary outcome was self-reported 7-day point prevalence of abstinence at 6-month follow-up. Intention-to-treat analysis and multiple logistic regressions were used. Trial registration: ClinicalTrials.gov: NCT03574077. **Results:** Most participants were aged 30 to 49 years (60.5%). The intervention group (vs. control group) included more men (88.7% vs. 71.9%, $P=0.02$, effect size=.21) and perceived quitting as more important (0-10 with higher score indicating greater importance, median: 8 vs. 7, $P=0.01$, effect size=.33). At 6-month follow-up (68.9% retained), more participants in the intervention group (vs. control group) quit smoking (16.1% vs. 5.3%; adjusted odds ratio (AOR): 2.83, 95% CI 0.70-11.30) and reduced daily cigarette consumption by at least 50% (quitters included; 32.3% vs. 19.3%; AOR: 1.74, 0.71-4.26). The intervention group had more participants with at least one quit attempt compared to control group (90.3% vs. 77.2%; AOR: 2.61, 0.88-7.82). The rate of at least once NRT-S use was significantly higher in the intervention than control group (62.9% vs. 38.6%; AOR: 2.27, $P<.05$). **Conclusion:** Semi-personalized IM was effective in increasing self-reported quitting, quit attempt and NRT-S use in community smokers. A definitive trial with analysis on the mechanism is warranted.

FUNDING: Nonprofit grant funding entity

PS4-54

KNOWLEDGE OF RISK OF CIGARETTE SMOKING AMONG MEDICAL STUDENTS' OF ONDO CITY, NIGERIA

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Significance: Cigarette contains many harmful agents. Nicotine in cigarette is highly addictive making smoking a difficult habit to break. Medical students should be knowledgeable about risks associated with smoking in order to offer an educated warning. The study aims to assess knowledge of Medical students' in Ondo State on the risk of cigarette smoking. **Methods:** A descriptive cross-sectional study was conducted amongst Medical students at the University of Medical Sciences Ondo, Nigeria. Data collection was via a structured self-administered questionnaire, univariate and multivariate statistical analysis was done using SPSS. **Results:** Of a total of 330 Medical students; 179 (54.2%) were males and 151 (45.8%) females. Age ranged between 15 - 42 years, with a mean of 19.4 ± 3.7 years. 143 (43.3%) are aware that a stick of cigarette contains over 40 carcinogenic agents. Most of the students; 244 (73.9%) are aware that nicotine contained in a cigarette is an addictive substance and many; 222(67.3%) agree that a passive smoker is one who voluntarily inhales secondhand tobacco smoke. Many of them (64.2%) know that incidence of lung cancer is influenced by the level of tar in cigarettes and a very large number 296 (89.7%) are aware that cigarette smoking is dangerous to the health of a pregnant woman and her unborn child. **Conclusion:** Medical students in Ondo city have very good knowledge of the risk of cigarette smoking. Further training will empower them to contribute to tobacco cessation program in this community.

FUNDING: Other

PS4-55

IS THE HEAVINESS OF SMOKING INDEX STILL RELEVANT TO SMOKING CESSATION? FINDINGS FROM THE 2016 AND 2018 INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY SMOKING AND VAPING SURVEYS

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Significance: The Heaviness of Smoking Index (HSI) has been regarded as the single best predictor of smoking cessation. Recently, external influences such as adoption of smokefree homes and reduced tobacco consumption have the potential to diminish the predictive value of this measure. It is also possible that the HSI may not be as predictive for younger smokers who are often in the early stages of tobacco dependence and without a stable tobacco consumption pattern. **Aim:** To test whether other measures such as urge to smoke and perceived addiction to smoking have independent predictive value for both making quit attempts and quit success and to determine if age moderates these

relationships. **Methods:** Participants were 3661 Wave 1 daily smokers (excluding those who also vape daily) from the 2016 ITC Four Country Smoking and Vaping survey, who were resurveyed in 2018 and reported smoking cessation outcomes. Multivariate logistic regression models that predicted probability of making a quit attempt, and success (defined as quit for at least 1 month) included gender, age group (<40, 40+), country, socioeconomic status, smoking restrictions in the home (allowed, sometimes allowed, never allowed), HSI, strength of urges to smoke in the past 24 hours and perceived addiction to smoking (not at all, somewhat, very). Age group by dependence measure (HSI, urges, addiction) interactions were also assessed. **Results:** Lower HSI (AOR=0.83, $p<0.001$), stronger urges to smoke (AOR = 1.13, $p<0.001$), younger age (AOR =0.62, $p<0.001$) and restricted smoking in the home (AOR =1.39, $p<0.001$) were associated with significantly higher probability of making a quit attempt by Wave 2. There were no significant age group by dependence measure interactions for probability of quit attempts. Regarding probability of quit success, higher HSI was associated with greater likelihood of failing to quit smoking in the younger age group but greater likelihood of success in the older age group (Age by HSI interaction, AOR = 1.95, $p=0.003$). The older age group were also more likely to quit if they did not perceive themselves as very addicted (AOR=2.16, $p=0.036$). Weaker urges to smoke also independently predicted quit success (AOR=0.84, $p=0.014$). **Conclusions:** HSI remains an important predictor of smoking cessation outcomes provided age is taken into consideration. Urge to smoke and perceived addiction to smoking can be considered as complementary to HSI and add further explanatory power to smoking cessation models.

FUNDING: Academic Institution

PS4-56

PERCEIVED HARMFULNESS OF NICOTINE REPLACEMENT THERAPY RELATIVE TO CONVENTIONAL CIGARETTES AMONG SMOKERS AND RECENT EX-SMOKERS. FINDINGS FROM THE 2016 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: Nicotine replacement therapy (NRT) is an effective smoking cessation aid but misperception of its harmfulness relative to conventional cigarettes may undermine its use to realise its therapeutic effects. This study aimed to examine smokers' and recent ex-smokers' perceptions of the harmfulness of NRT relative to smoking, associated factors and any country differences. **Methods:** Data (n=11,838) come from the 2016 ITC Four Country Smoking and Vaping Survey conducted in the US, Canada, England and Australia among smokers and recent ex-smokers. Perceived NRT harmfulness relative to smoking and its correlates were analysed using logistic regression. **Results:** Overall, around two-thirds of the respondents believed that NRT is less harmful than smoking, with those from Canada and the US, but not Australia, being less likely to do so than those from England (odds ratio [OR]=.83, 95% confidence interval [CI]=.73-.93; and .66, 95%CI=.58-.75, respectively). Across all four countries, respondents who were white, with higher knowledge of smoking health harms, and believing vaping is less harmful than smoking were more likely to perceive NRT being less harmful than smoking (all $p<.001$). In Canada and England only, those believing nicotine is harmful to health were less likely to perceive NRT being less harmful (OR=.90, 95%CI=.83-.99; and .79, 95%CI=.73-.86, respectively) with high income respondents from these two countries being more likely to do so (OR=1.45, 95%CI=1.17-1.82; and 1.48, 95%CI=1.17-1.88, respectively). In the US and England only, non-vapers (OR=1.34, 95%CI=1.04-1.71; and 1.30, 95%CI=1.00-1.69, respectively) were more likely than daily vapers to perceive NRT being less harmful as were female Australians compared to their male counterparts (OR=1.36, 95%CI=1.03-1.79). **Conclusions:** While the majority of smokers and recent ex-smokers from the US, Canada, England and Australia held accurate perception about the harmfulness of NRT relative to smoking, one in three were still misinformed. Corrective education may be necessary to ensure that this subgroup can also benefit from the use of NRT to help with quitting smoking.

FUNDING: Federal; State



PS4-57

PARENTAL COMMENTS ON ELECTRONIC CIGARETTES AND THEIR ASSOCIATIONS WITH KNOWLEDGE, ATTITUDES AND SUSCEPTIBILITY TO ELECTRONIC CIGARETTE USE IN HONG KONG ADOLESCENTS

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Significance Parents have strong influence on adolescent tobacco use. We studied parental comments on e-cigarettes (ECs) and their associations with knowledge, attitudes and susceptibility to EC use in Hong Kong adolescents who had never used tobacco. **Methods** In 2016/17, 8522 Secondary 1-6 (Grade 7-12) students (mean age 14.9, SD 1.7 years; 54.9% boys) who completed an anonymous questionnaire had never used tobacco. The study factor was whether their parents had commented on ECs in the past 3 months, categorised as no (reference), harms only, benefits only, and both. Dependent variables included knowledge, attitudes and susceptibility to EC use. Reporting "definitely not" or "probably not" (vs "definitely yes" or "probably yes") that EC use may harm their health denoted poor knowledge. Attitudes towards ECs as "very positive", "positive" and "neutral" (vs "negative" or "very negative") denoted positive attitudes. Answering "definitely not" (vs "probably not", "probably yes" or "definitely yes") to both questions on the intention to use ECs (i) in the next 12 months and (ii) when offered by good friends, denoted not susceptible, and otherwise as susceptible. Logistic regression was used to examine the associations of knowledge, attitudes and susceptibility to EC use with parental comment, adjusting for socio-demographic characteristics, parental EC use and school clustering effect. **Results** Most (93.5%) students reported no parental comments on ECs, 5.9% reported harms only, 0.4% benefits only and 0.2% both; 10.3% had poor knowledge, 29.6% had positive attitudes and 16.5% were susceptible to EC use. Compared with no parental comments, comments on harms only were negatively associated with poor knowledge, positive attitudes and susceptibility with adjusted odds ratios (AOR) (95% CI) of 0.65 (0.47-0.90), 0.49 (0.37-0.66) and 0.74 (0.55-0.98), respectively. In contrast, comments on benefits only were associated with poor knowledge (AOR 4.49, 95% CI 2.38-8.47) and susceptibility (4.39, 2.04-9.47). No significant associations were observed for comments on both harms and benefits. **Conclusions** In Hong Kong adolescents, parental comments on benefits only were strongly associated with poor knowledge about the harms of ECs and susceptibility to EC use in adolescents, but comments on harms only showed weaker protective association. Parents should wisely communicate the harms of ECs. Qualitative studies and prospective studies should be conducted to understand the effects of parent-child communications on adolescent EC use.

FUNDING: Other

PS4-58

WIDENING DISPARITIES IN CIGARETTE SMOKING BY EDUCATION LEVEL ACROSS RACE/ETHNIC GROUPS IN THE US

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Significance: Cigarette smoking continues to decline overall for adults in the United States (US) as tobacco control efforts increased. The extent of gains achieved varies and is influenced by different factors, including race/ethnicity and education. This study examines the racial/ethnic trends in ever and current smoking, cigarette consumption, and quit ratios by education level among the three largest groups in the US between 1992/93 and 2014/15. **Methods:** The Tobacco Use Supplements (TUS) to the U.S. Census Bureau's Current Population Survey (CPS) from 1992/93 to 2014/15 were analyzed. Smoking categories of interest included ever smoking (at least 100 cigarettes in entire life), current smoking (ever smokers who currently smoke cigarettes every day or some days), cigarette consumption (cigarettes per day; CPD), and quit ratio (proportion of ever smokers who have quit; QR) for African Americans (AA), Hispanics/Latinos (HL), and non-Hispanic Whites (NHW). Weighted prevalence estimates used respondents' person-level TUS-CPS survey weights, and data were standardized by race/ethnicity to the 2010 US population. **Results:** Among ever smokers, AA college graduates had the lowest rates over time compared to other race/ethnic groups, while the rates for HL of all education levels resembled those of the most educated NHW. Among current smokers, there was a growing education-level disparity for AA and NHW, with no significant differences for HL. There were differences in cigarette consumption by education level over time for NHW, with CPD declining with higher education level. Lastly, the highest QRs were reported for college graduates, highest among NHW and lowest among AA.

Discussion: Research is limited on cigarette smoking behaviors by education levels within race/ethnicity. Findings indicate that significant disparities have persisted, and even widened when examining across education levels, particularly for AA and NHW, despite continual anti-tobacco policies and programs. Taking into consideration varying educational level may help better address disparities when developing strategies to reduce smoking behaviors for specific races/ethnicities.

FUNDING: State

PS4-59

SMOKING DENORMALISATION: A CONCEPTUAL FRAMEWORK

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SIGNIFICANCE: As more countries adopt progressive policies to reduce smoking prevalence, including setting 'endgame' goals, smoking has become less socially accepted. Smokers may experience this increasing denormalisation (DN) of smoking in different ways; while some report feeling motivated to quit as smoking prevalence falls, others resist measures designed to stimulate quitting. We aimed to develop a conceptual framework of DN, its impact on smokers, and measures that would enable monitoring of DN domains. **METHODS:** We undertook a narrative review of studies published since 2013 to examine how DN had been conceptualised and inform measures that could monitor experiences of DN. Measures draw on Link and Phelan's theory of stigma, which focusses on differences and their association with negative characteristics to create 'other' groups that lose status as power imbalances between groups with and without the negative attribute develop. **RESULTS:** Our framework highlights tensions between risks and benefits arising from DN and includes three domains: societal, social, and personal DN. Societal DN positions smokefree lifestyles as normal and could be monitored by assessing smokers' status relative to non-smokers, and their perceptions of smokefree interventions. Changing norms within social networks that once accepted smoking may alter perceptions of smoking's pervasiveness; measures could include perceived smoking prevalence and normativity within social groups. DN may affect individuals by empowering quitting or, alternatively, by increasing dissonance, potentially leading to reactance. Measures here could include personal well-being, 'othering', loss of agency and subversion of smokefree measures. Associations between all domains and cessation-related behaviours could also be measured to gain a deeper understanding of how DN works as could smoking DN's intersection with stigma experienced through other power imbalances, such as gender or ethnicity. **CONCLUSIONS:** While many countries use DN to reduce smoking prevalence, few have monitored how perceptions of DN at societal, social and personal levels evolve, or the positive and negative impacts on smokers over time. Systematic monitoring of how DN may affect other power imbalances, which may have predisposed smoking uptake, is also required. Given DN has risks as well as benefits, the measures outlined are increasingly relevant as strategies to reduce smoking prevalence intensify.

FUNDING: Unfunded

PS4-60

A SOCIAL NETWORK-BASED SMOKING CESSATION INTERVENTION FOR CHINESE MALE SMOKERS (SCAMPI) - A PILOT RANDOMIZED CONTROLLED TRIAL

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Significance. Every year, around 2 million Chinese people die from tobacco-related diseases, mostly men; yet fewer than 8% of Chinese smokers have ever received any smoking cessation advice or support. This study aimed to test the preliminary effectiveness and feasibility for a WeChat social network platform-based mobile phone smoking cessation intervention ('SCAMPI') in Chinese men. **Methods** We recruited 80 Chinese male smokers aged 25-44 years from the WeChat platform. Eligible participants were randomly assigned to intervention or control groups. The intervention group received access to a Chinese-language smartphone smoking cessation mini-program developed from theoretical models of behaviour change and a rapid iterative development process with potential end-users done entirely via WeChat, plus guideline-based information about the harms of smoking. Controls received information on how to contact the Chinese Quitline and cessation clinics. Both received incentive credit payments to their WeChat account for participating. The primary outcome was 30-day biochemically verified smoking abstinence 6 weeks after randomisation. Secondary outcomes recruitment, retention, acceptability of and satisfaction with the program. **Results.**



Eighty participants from around China were recruited over 13 days in January 2019. At 6 weeks, 36/40 (90%) intervention and 35/40 (87.5%) control participants provided complete self-reported data on their daily smoking status via WeChat. Biochemically verified smoking abstinence at 6 weeks was 10/40 (25%) in the intervention group and 2/40 (5%) in the control group (RR=5.0, 95% CI 1.2-21.4, p=0.025). Participants rated satisfaction with the intervention highly (4.6/5.0). **Conclusion.** SCAMPI programme is a feasible, acceptable and potentially effective smoking cessation intervention for Chinese men. A future trial with greater sample size and longer follow-up (6 months) will identify if it is as effective as these preliminary data suggest.

FUNDING: Academic Institution

PS4-61

SURVEILLANCE OF THE DOMINANT JUUL INFLUENCERS ON TWITTER

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Significance. Social media has become a very influential means of sharing information and advertising, and individuals and organizations that have very large social networks on social media, such as Twitter, can be impact attitudes and behavior. However, few studies have assessed the most influential people in social media regarding e-cigarettes, such as Juul, so the scope of those influencers is not known. Because Juul has become the most commonly used ENDS product in the U.S, this study explores reach and characteristics of the most influential people discussing Juul on Twitter. **Methods.** We used web crawlers developed by Python 3 and Twitter API to collect tweets about Juul on Twitter from January 1, 2019 to June 24, 2019. This time frame and social media platform was selected in order to obtain a surveillance snapshot of influencers and their reach on one popular platform. For each tweet, we collected its content, number and content of comments, number and content of the forwarding, amount of praise, information on the user, geographic information, posting information, number of followees, and number of followers. **Results.** During the period that we assessed, we identified 7 people who discussed Juul on Twitter who each had at least 50,000 people that they influenced, and the leading person discussing Juul influenced 291,127 people. Many others discussed Juul, but they had fewer followers. The cumulative influence of the top 7 people discussing Juul on Twitter during that short period was 955,924. Most of them were located in the US. Further analyses on these influencers will be discussed, along with tweet content such as discussion of flavors and use patterns. **Conclusions.** This surveillance study of social media indicates that a small number of people posting on Twitter impact hundreds of thousands of followers, and when one considers that there are multiple social media platforms and a much wider timeframe, the breadth of social media influence is extensive and requires further analysis to better understand its influence given the rapid rise in Juul (and other ENDS) use. These data also suggest that increased surveillance of social media is an important data source in addition to surveys and product sales to better understand use of nicotine and tobacco products.

FUNDING: Federal

PS4-62

YOUTH VAPING AND TOBACCO USE IN CONTEXT IN THE UNITED STATES, RESULTS FROM THE 2018 NATIONAL YOUTH TOBACCO SURVEY

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Significance: According to the National Youth Tobacco Survey (NYTS), youth e-cigarette use (vaping) rose between 2017-2018. Frequency of vaping and concurrent past 30-day (p30d) use of e-cigarettes and tobacco products have not been reported. **Methods:** We analyzed the 2018 NYTS (N=20,189) for vaping among all students (middle and high school) by frequency of vaping, exclusive vaping, p30d poly-product use, and any past tobacco product use. **Results:** In 2018, 81.6% of students had never used any tobacco product and 86.2% had never vaped. Among all students, 13.8% vaped in the past 30 days (7.0% on ≤5 days, 3.2% on 6-19 days, and 3.6% on 20+ days), consisting of 9.9% who reported past or concurrent tobacco use and 3.9% who were tobacco naïve. 2.8% of students were tobacco naïve and vaped on ≤5 days; 0.4% were tobacco-naïve and vaped on 20+ days. **Conclusions:** Vaping increased among US youth in 2018 over 2017. The increases are characterized by patterns of low p30d vaping frequency and

high poly-product use, and a low prevalence of vaping among more frequent but tobacco naïve vapers. **Implications:** Results underscore the importance of including the full context of use patterns. The majority of vapers (60% - 88.9% by use frequency) were concurrent p30d or ever tobacco users. Few tobacco-naïve students vaped on 20+ days in the p30d. Reporting youth vaping data with frequency and tobacco product co-use will give public health decision-makers the best possible information to protect public health.

FUNDING: Academic Institution

PS4-63

ASSOCIATION BETWEEN TOBACCO SMOKING STAGES AND DEPRESSIVE MOOD AMONG KOREAN ADOLESCENTS

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Significance: The association of tobacco smoking with depressive mood has been known. In Korea Youth Risk Behavior Web-based Survey (KYRBS), the age of first reported daily smoking among adolescents has declined for the last ten years. Therefore, we explored the steps from an earlier trial to established daily smoking to study the association with depressive mood. **Methods:** KYRBS is annual national-representative cross-sectional surveillance for Korean adolescents. The five smoking stages consist of never smokers, ever smokers or just tried, intermittent smokers, daily smokers who slowly progress, and daily smokers who rapidly progress within two years. In 2008-2017 (n=690,602) data, distribution of the five smoking stages were described. In 2013-2017 data (n=266,631), logistic regression was used to examine the association between the five smoking stages and the past-year depressive mood among Korean adolescents. **Results:** Never smokers were 79.81%(n=552,317); Ever smokers or just tried was 11.15%(n=77,263); Intermittent smokers was 4.22%(n=14,197); Daily smokers who slowly progress was 1.31%(n=7,348); Daily smokers who rapid progress was 3.51%(n=16,836). Over the past decade, 'Ever smokers or just tried' was decreased from 13.7% in 2008 to 6.63% in 2017; 'Intermittent smokers' 4.89% in 2008 to 2.76% in 2017; 'Daily smokers who slowly progress' from 1.45% in 2008 to 0.88% in 2017; 'Daily smokers who rapid progress' was also decreased from 4.67% in 2008 to 1.83% in 2017. The prevalence of the past-year depressive mood was decreased from 38.41% in 2008 to 24.71% in 2017. All of the smokers' groups were significantly suffered from the past-year depressive mood than 'Never smokers'. ('Ever smokers or just tried' OR 1.26, 95% CI 1.21-1.30; 'Intermittent smokers' OR 1.49, 95% CI 1.41-1.57; 'Daily smokers who slowly progress' OR 1.49, 95% CI 1.36-1.62; 'Daily smokers who rapid progress' OR 1.47, 95% CI 1.39-1.57) The OR was highest among 'Daily smokers who slowly progress' (OR 1.56, 95% CI 1.41-1.72) in boys, while it was 'Daily smokers who rapidly progress' group (OR 1.53, 95% CI 1.34-1.75) in girls. **Conclusions:** Among Korean adolescents, ever or just tried, intermittent, as well as current daily smoker groups were significantly associated with the past-year depressive mood than never smokers. Further researches are needed for the early tobacco trial, non-daily smokers and progression stages of adolescents considering mental health and tobacco prevention.

FUNDING: Other

PS4-64

PROMOTING SMOKE-FREE HOMES IN NEONATAL INTENSIVE CARE UNITS

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Significance: Babies born to smokers weigh on average 200g less than those born to non-smokers and are at 40% higher risk of being born preterm. The relative risk of admission to Neonatal Intensive Care units (NICU) for infants of smokers is increased by at least 20%. Parents of infants admitted to NICU may feel helpless and overwhelmed at a time when their baby is critically ill. Stopping smoking, or remaining abstinent, is one of the few things that parents can do to significantly improve the longer-term recovery and health of their offspring. NICU admission may represent a 'teachable moment' where parents are receptive to discussing smoking cessation. **Methods:** Systematic review of behaviour change techniques (BCTs) in smoking cessation interventions in paediatric settings and qualitative study defining parent preferences for intervention. Review protocol pre-registered on the open science framework. Qualitative focus group study (n=10 groups of 6-8 participants). Purposively recruiting parents and fam-



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ily members of babies admitted to NICUs across two large teaching hospitals in the UK. **Results:** Our review found very limited available evidence on smoking cessation, relapse prevention or smoke-free environment interventions delivered on NICUs, and no UK RCTS. Of included trials across paediatric settings, most interventions used motivational interviewing and information giving/self-help resources. Focus group data suggests that parents are amenable to smoking cessation support and are surprised that the subject is not addressed. Support with cessation and relapse prevention through information about smoke-free homes, nicotine replacement therapy and/or support to use nicotine in significantly less harmful ways (e.g. vaping) were identified as promising routes for intervention. **Conclusions:** There is little dedicated support for smoking cessation, relapse prevention or smoke-free homes for families of NICU babies. Parents are amenable to support and consider a focus on smoke-free homes as a less stigmatising way in which smoking may be discussed and cessation promoted to improve the health of premature babies.

FUNDING: State

PS4-65

A MULTILEVEL ANALYSIS OF EXPOSURE TO SECOND-HAND TOBACCO SMOKE AMONG SCHOOL-GOING ADOLESCENTS IN ENUGU, NIGERIA

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Significance: Tobacco use is the largest preventable cause of deaths globally. Besides direct tobacco smoking, second-hand tobacco smoke (SHS) has been associated with increased morbidity and mortality. Children and adolescents are vulnerable to SHS exposure, particularly in developing countries yet limited data is available on SHS exposure among adolescents in Nigeria. We sought to determine the prevalence and factors associated with SHS exposure among adolescents in Enugu, Nigeria. **Methods:** This was a cross-sectional study of 4332 adolescents from 25 urban and 24 rural secondary schools in Enugu State, Nigeria, selected by stratified two-stage cluster sampling with probability proportional to school enrollment size. Schools were the primary sampling units. Students were asked about exposure to SHS - at home, indoor and outdoor public places - within past 7 days using self-administered semi-structured questionnaires adapted from Global Youth Tobacco Survey (GYTS). Weighted prevalence estimates and 95% confidence intervals of exposure to SHS were calculated. Mixed effects logistic regression models were used to determine predictors of SHS exposure at <0.05 statistical significance. **Results:** About 60.4% of the students (95% CI: 57.6-63.3%) reported SHS exposure in past 7 days; 24.3% of students reported exposure at home (26% in rural vs 22.7% in urban schools, $p=0.01$); 47.1% reported exposure in indoor public places (48.7% in urban vs 45.5% in rural schools, $p=0.03$); and 48.1% reported exposure in outdoor public places (49.1% in urban vs 47% in rural schools, $p=0.16$). Students in rural schools (vs urban, adjusted odds ratio [aOR]: 0.74, 95% CI: 0.58-0.93) and boarders (vs day students, aOR: 0.59, 95% CI: 0.45-0.77) were less likely to be exposed to SHS. However, students who were current smokers (vs non-smokers, aOR: 2.03, 95% CI: 1.62-2.55), those who saw someone smoke in school (vs none, aOR: 1.25, 95% CI: 1.05-1.50), students who had one smoking parent (vs none, aOR: 1.76, 95% CI: 1.33-2.33), and students who had some smoking friends or classmates (vs none, aOR: 1.86, 95% CI: 1.45-2.39 for friend smokers and aOR: 1.49, 95% CI: 1.21-1.84 for classmate smokers respectively) were more likely to be exposed to SHS. **Conclusion:** Exposure to SHS among school-going adolescents in Enugu, Nigeria is high, and mostly occurs outside the home. Interventions to limit exposure of adolescents to SHS particularly in public places are urgently needed.

FUNDING: Nonprofit grant funding entity

PS4-66

CIGARETTE SMOKING, SMOKELESS TOBACCO, ALCOHOL AND MARIJUANA USE AMONG YOUTH. A JOINTPOINT ANALYSIS OF MONITORING THE FUTURE DATA, 1991-2018.

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Significance: E-cigarette use has been increasing in popularity among adolescents. However, it is unclear if these changes have affected other tobacco product use trends. We analyzed long term and recent trends in cigarette smoking and smokeless tobacco by grade, sex and race using the Monitoring the Future (MTF) data. Marijuana and alcohol trends were also analyzed for context. **Methods:** Using MTF data (1991-2018),

we estimated the prevalence of any past 30-day and daily cigarette, smokeless tobacco, alcohol and marijuana use. Prevalence of e-cigarette use in the past 30-day from 2015-2018 was also estimated. Analyses were stratified by grade (8th/10th/12th) and sex (Male/Female), and by grade and race (White/Black). We used joinpoint regression to characterize use trends for all sociodemographic groups, identifying change of trend years (joinpoints) and estimating the annual percentage change (APC) within each trend segment. **Results:** E-cigarette use increased rapidly from 2015-2018, particularly among females and whites. Past 30-day and daily smoking showed an increase in all categories from 1991 until 1996 and has been decreasing ever since. For example, 12th grade female past 30-day smoking increased at 5.4 APC (1991-1997), then decreased at -5.9 APC (1997-2013), and finally at -14.2 APC (2013-2018). Similar patterns were seen in all other sociodemographic groups and for daily use. Smokeless tobacco use showed more variability through 2012, followed by consistent declines in the last 5 years. Decreases in past 30-day alcohol use have also accelerated recently, e.g., 12th grade females use decreased at -1.68 APC in 1997-2014 and then at -4.68 APC in 2014-2018. Marijuana use has been stable in general, but with considerable increases among females (2.5 APC, 2007-2018) and blacks (3.7 APC, 2004-2018). **Conclusions:** Despite its increase in popularity, e-cigarette use does not seem to be counteracting declines in smoking and smokeless prevalence at least until 2018. Alcohol use shows similar accelerated decreases in recent years, suggesting general behavioral changing patterns among adolescents. However, marijuana use is stable and even increasing in key demographic groups.

FUNDING: Federal

PS4-67

SMOKING CESSATION OUTCOMES OF TOBACCO QUITLINE CALLERS WHO USE CANNABIS

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Significance: Cannabis use has increased considerably over the last 15 years among adults in the United States. The prevalence of cannabis use is higher among cigarette smokers compared to non-smokers in the general population. Given ongoing changes in cannabis policy, evaluating whether cannabis use is associated with likelihood of quitting smoking among treatment seeking smokers is needed to inform intervention and service delivery. The aim was to determine how tobacco cessation outcomes were associated with cannabis use. **Methods:** Data were analyzed from 1,868 adult smokers who called the New York State Smokers Quitline (NYSSQL) from 2018-2019 for assistance with quitting smoking and responded to an evaluation survey 7 months after intake. Information on demographics, past-month cannabis use, and tobacco use behaviors were collected at intake. Tobacco cessation was defined by self-reported past 7-day abstinence (y/n) on the 7-month follow-up survey. Logistic regression modelling was used to compare smoking cessation outcomes for callers who reported past month cannabis use compared to non-cannabis users, controlling for demographics and smoker characteristics (i.e., sex, age, race, education, cigarettes per day, time to first cigarette, and response type). Data were weighted to adjust for response bias. **Results:** At baseline, 114 (6.1%) callers reported past month cannabis use. At the 7-month follow-up, 30.7% of past 30-day cannabis users reported that they had not smoked cigarettes at all in the past 7 days, compared to 34.1% of callers who did not report past-month cannabis use (OR=0.61, $p=0.09$; CI:0.35-1.07). Past-month cannabis users who reported interest in stopping cannabis use (> 5 on a scale from 0 to 10) were no more likely to quit smoking at follow up (33.3%) than users with less interest in stopping cannabis use (31.0%, $p=0.80$). **Conclusions:** Among adult NYSSQL callers, cannabis use may be associated with decreased success in cigarette smoking cessation. As more states consider legalizing medical or recreational cannabis use, determining the most effective tobacco cessation treatment options for co-users will become an important public health priority.

FUNDING: State

PS4-68

MSC

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Significance: Even though most tobacco users express a wish to quit tobacco, success-rates for quitting are generally low. The emotional bond that ties a tobacco user to the tobacco brand of choice might be a factor that reduces the chances of successful quitting. **Methods:** In a Norwegian longitudinal sample of 753 ever snus users and 871 ever smokers, collected in the spring 2017 (T0) and the winter 2018/19 (T1), associations between last year (T0) emotional attachment to snus and cigarette brands (among snus users and smokers, respectively), and current tobacco use status were estimated in adjusted logistic regressions. Results: A negative association was found between emotional snus brand attachment and snus use cessation (AOR=0.83, $p<0.05$). There was no significant association between cigarette brand attachment and smoking cessation. **Conclusion:** Results suggest that a strong emotional attachment could hinder snus use cessation. Measures that reduce such attachment might give increased cessation activity.

FUNDING: Academic Institution

PS4-69

PSYCHOLOGICAL DISTRESS AMONG TOBACCO QUITLINE CALLERS WHO USE CANNABIS

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Significance: Cannabis use is increasing among adults in the US. Recent data show that the prevalence of serious psychological distress (SPD) is higher among individuals who use cannabis and among those who use cigarettes, and that the prevalence of SPD among cigarette smokers is increasing. This study aims to determine the prevalence and correlates of cannabis use among adult smokers with and without past-month SPD who called the New York State Smokers Quitline (NYSSQL) in 2018-2019. **Methods:** We assessed psychological distress among callers to the NYSSQL (measured by the Kessler Psychological Distress Scale (K6)). Logistic regression modelling was used to determine the relation of SPD status (K6 score of ≥ 13) to tobacco and cannabis use variables (time to first cigarette, number of cigarettes smoked per day, interest in stopping cannabis) and demographic measures. **Results:** Among 8,259 callers to the NYSSQL, over one in ten (12%) met criteria for past-month SPD and 8.6% reported past month cannabis use. Past-month SPD was significantly more common among callers with past-month cannabis use (17.8%) compared to those without (17.8% vs. 11.5%, OR=1.64, $p<0.001$). SPD was higher among females (13.8%) vs. 9.7%, OR=1.75, $p<0.001$), and among heavier (> 10 cpd) smokers compared to those smoking less than 10 cigarettes per day (18.6% vs. 10.9%, OR=1.62, $p=0.02$), and those who smoke immediately in the morning (18.6%) compared to those who wait (8.3%, OR=1.49, $p=0.03$). Tobacco users with SPD who are also past-month cannabis users were more likely to report interest in stopping cannabis use, reporting a mean of 4.2 on a scale from 0 (none) to 10 (most), compared to smokers without SPD who also use cannabis (mean = 3.3, $p=0.03$). **Conclusions:** Given the expansion of legalized medical and recreational use of cannabis, understanding the impact of regular use on vulnerable groups, such as those with mental health problems (i.e., SPD), becomes increasingly important. Our findings suggest that smokers with SPD who also use cannabis may require more complex tobacco dependence treatment and may not be as successful with standard care.

FUNDING: State

PS4-70

RECIPROCAL INFLUENCES OF TOBACCO USE AND SUBSTANCE USE DURING THE FIRST SIX-MONTHS OF SPECIALIST ADDICTION TREATMENT

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Significance. The prevalence of daily tobacco smoking has declined by almost 30% since 1990 and is currently estimated to be 15.3%. Certain populations, including those with a substance use disorder (SUD), appear to be more vulnerable to tobacco smoking. Evidence suggests the SUD population are heavier smokers and appear to be at a heightened overall risk of tobacco-related mortality and of dying at a younger age than the non-SUD population. Though apparently cognisant of the risks related to smoking and willing to engage with tobacco cessation services, successful quit rates

for persons with SUD are poor, at around a quarter the rate of those without an SUD. In this study, we investigate parallel changes in tobacco use and the primary substance targeted for specialist addiction treatment interventions during the first six-months of treatment. We hypothesise that: 1) Reductions in the primary addiction substance will be substantially greater than reductions in tobacco use; 2) More frequent use of tobacco at treatment admission will negatively affect change in the frequency of primary addiction substance use; 3) More frequent use of the primary addiction substance at treatment admission will negatively affect change in the frequency of tobacco use. **Methods.** This was a six-month, prospective, observational cohort study of all adults (18 years and older) admitted to publicly-funded specialist community-setting treatment services in England for opioid use disorder ($n=41,178$) or alcohol use disorder ($n=50,656$) between 01 April 2017 and 31 March 2018. Of these, only patients who were still engaged in treatment after six months (ending 30 September 2018) were selected for analysis. The study is reported following RECORD guidelines for observational research using administrative health data. A series of cross-lagged panel models were used to estimate the relationship among patient primary drug use frequency (i.e. opioid or alcohol) and tobacco use frequency between admission and six months. **Results.** Results from the modelling will be presented. **Conclusions.** The findings are envisaged to inform clinical and policy decision making

FUNDING: Unfunded

PS4-71

DIFFERENCES IN TOBACCO CESSATION MOTIVATION AND NICOTINE-MARIJUANA INTERACTION EXPECTANCIES AMONG CO-USERS OF TOBACCO AND MEDICAL OR RECREATIONAL MARIJUANA

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Significance: Research has shown that tobacco and marijuana co-users have worse tobacco-related cessation outcomes. To increase tobacco cessation among marijuana users, it is important to understand potential differences between medical and recreational marijuana users in frequency of marijuana use and modifiable variables (e.g., expectancies, motivation) that could be targeted in tobacco cessation interventions. To examine this, we analyzed data from an online survey of tobacco smokers across Florida, where medical marijuana was legalized in 2016. **Methods:** Florida residents were recruited via online ads (Craigslist) and an online research panel. Participants completed a survey during June and July, 2018, that assessed demographics, cigarette smoking, nicotine dependence, motivation to quit cigarette smoking, marijuana use, physician's recommendation for medical marijuana use, and nicotine and marijuana interaction expectancies. Analyses are based on responses from 321 current marijuana (past year) and tobacco co-users. **Results:** Participants' mean age was 38.6 ($SD = 12.8$) years; 53% were female; 66% were non-Hispanic white; 82% were recreational and 18% were medical users of marijuana; 39% were daily users of marijuana. Medical users did not differ from recreational users in frequency of marijuana use ($p=.48$). Medical users were more likely to smoke fewer cigarettes per day, to plan to quit smoking within 30 days, and to have stronger nicotine and marijuana interaction expectancies (e.g., marijuana use leads to wanting a cigarette) compared to recreational users ($p's<.05$). Results were the same when controlling for age and race/ethnicity. **Conclusion:** With respect to targeted interventions, medical marijuana users expressed greater motivation to quit tobacco smoking; however addressing nicotine and marijuana interaction expectancies may be important for this subgroup. Recreational marijuana users may require interventions focused on increasing motivation to quit tobacco smoking. Future research is needed to determine the need and impact of differential smoking interventions based on reasons for marijuana use.

FUNDING: State

PS4-72

MEASURING NICOTINE DEPENDENCE AMONG YOUTH IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY (2013-2014)

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Significance: The PATH study, a nationally representative survey of individuals ages 12 years and older, assesses nicotine dependence using items derived from several



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validated measures. Among adults, these items can be scored as a single scale to assess dependence on several tobacco products. However, it is unknown whether the same holds true for youth. The current study examines whether a single-factor structure also is applicable for youth. **Methods:** Participants were 2,175 youth who were past year tobacco users at Wave 1 (2013-2014) of the PATH study. Dependence items were drawn from the Hooked on Nicotine Checklist (HONC; 2 items), Fagerstrom Test for Nicotine Dependence (FTND; 1 item), and Wisconsin Inventory of Smoking Dependence Motives (WISDM; 7 items). Participants also reported when they had last used cigarettes, cigars/cigarillos, e-cigarettes, hookah, and smokeless tobacco. Using the PATH public use files, we conducted factor analysis to examine the factor structure for the 10 items. **Results:** The 10 nicotine dependence items reflected a single factor structure, with factor loadings ranging from .80 to .96 and a strong Cronbach's alpha (0.86). **Conclusions:** Consistent with results observed in the adult PATH sample, the 10 nicotine dependence items reflected a single factor with good internal consistency among youth. Future work should use item response theory to examine the psychometrics of this scale among different user groups (e.g., cigar users vs. hookah users).

FUNDING: Federal

PS4-73

HOW MUCH PROGRESS HAVE WE MADE? MEASURING TRENDS IN DISPARITIES FOR MULTIPLE TOBACCO PRODUCTS

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Significance: Recent research has demonstrated that cigarette smoking disparities remain unchanged or have increased among priority populations. However, less is known about how disparities have changed for other tobacco product use and in states with strong tobacco control programs. This study examined changes in tobacco use using rate ratios and population attributable proportions (PAP)—two measures of health inequities—as well as prevalence estimates from three rounds of the Minnesota Adult Tobacco Survey (MATS). Method: MATS is a cross-sectional survey representative of adult Minnesotans. MATS 2010 (N=7,057), 2014 (N=9,304), and 2018 (N=6,055) assessed past 30-day use of cigarettes, cigars, smokeless, and e-cigarettes. Weighted analyses of descriptive statistics and logistic regression examined (1) prevalence of tobacco use over time by race, education, and income, and (2) rate ratios and PAPs to assess changes in disparities over time. Results: Tobacco use prevalence declined from 2010 - 2018 with the exception of e-cigarettes (cigarettes: 17.3% to 15.3%, respectively; cigars: 3.2% to 3.0%; smokeless: 4.0% to 3.2%; e-cigarettes: .01% to 6.0%; all combustible: 18.8% to 16.9%; any tobacco: 21.1% to 21.4%). Analyses of risk ratios and PAPs showed some increases in disparities and little evidence of reductions. The rate ratio for cigarette use disparities by income increased from 2010 (2.02) to 2018 (2.39), as did rate ratios and PAPs for cigar use disparities by race between 2010 - 2018 (from 2.13 to 2.55 and .047 to .080, respectively). Prevalence estimates revealed several main effects for use of various products in the predicted direction (low income/education groups reported higher prevalence), but no significant time by demographic interactions, suggesting little change in disparities over time. Conclusion: While overall smoking prevalence has declined in recent years, tobacco use disparities among African Americans, low income, and low education groups persist even in a state with strong tobacco control programs. Targeted population-based interventions are needed to reduce all forms of tobacco use among groups experiencing a disproportionate burden of tobacco harm.

FUNDING: Federal; State; Nonprofit grant funding entity

PS4-75

SOCIO-DEMOGRAPHIC DIFFERENCES IN LATENT CLASSES OF TOBACCO USE IN US ADULTS

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Background: Given the growing diversity of available nicotine products and complexity in patterns of use, we conducted latent class analysis (LCA) to summarize patterns then identified socio-demographic differences across patterns. Methods: Using adult PATH Wave 3 (2015-16) public data (n=28,141), we conducted LCA of past-30 day frequencies of use (0, 1-5, 6-10, 11-15, 16-20, 21-25, 26-30 days) for

10 tobacco products in current established users (n=12,244). Comparing latent classes of users with non-users (n=15,852), we conducted multinomial regression to estimate socio-demographic differences, controlling for other substance use and mental health symptoms. We accounted for survey weights, design and regression model uncertainty. Results: In addition to non-users (C1=75%), we identified 4 distinct latent classes of users (C2-C5): frequent exclusive cigarette smokers (C2=16%); occasional cigarette and poly users (C3=4%); frequent e-product and occasional cigarette users (C4=2%); and frequent smokeless tobacco users (C5=2%). Cigarette use frequency was highest in C2 (87% of days), followed by C3 (33%), C4 (28%), and C5 (9%). C4 and C5 used e-products and smokeless tobacco on 72% and 85% of days, respectively. Young adults (18-24 v. >55 years) had lower odds of frequent exclusive cigarette smoking (OR=0.7; 95%CI=0.6,0.8). Males (v. females) had especially higher odds of frequent smokeless tobacco use (OR=29.0; 95%CI=19.0,44.2) and occasional cigarette and poly use (OR=3.2; 95%CI= 2.8,3.7). Sexual minorities (v. heterosexuals) had lower odds of frequent smokeless tobacco use (OR=0.4; 95%CI=0.2,0.7), but higher odds of e-product use (OR=1.7; 95%CI=1.3,2.1). Non-Hispanic Blacks (v. Non-Hispanic Whites) had higher odds of occasional cigarette and poly use (OR=1.5; 95%CI=1.2,1.8), but Blacks and Hispanics had lower odds of frequent cigarette, e-product, and smokeless tobacco use. Lower education, receiving welfare, substance use and mental health symptoms increased odds of being in each using class (C2-C5). Conclusions: The distinct patterns of tobacco use differed across socio-demographic factors, which may lead to downstream disparities if not mitigated by interventions.

FUNDING: Federal

PS4-76

TOBACCO AND CANNABIS: ADS INCREASE INTENTION TO CONSUME AND PURCHASE ACROSS SUBSTANCES FOR POLYSUBSTANCE USERS

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BACKGROUND: Increasingly, advertising for products that can be used as a substitute for (e.g. e-cigarettes (ENDS)) or are visually similar to (cannabis) traditional combustible cigarettes is available in numerous contexts. The effect of product type on how similar advertising is processed is poorly understood. Thus we ask, how does perceived product affect how messages are processed? Is there a difference, when controlling for product experience? **METHODS:** In an experiment (N = 521) young adults (17-28) (M = 21, SD = 1.43). Participants were told that they were seeing packages or the act of (1) ENDS/vaping, (2) cigarettes/smoking, (3) cannabis vape pens/vaping cannabis, or (4) joints/smoking cannabis, though the images across conditions were identical. Participants were asked pre- and post- test urge (subtracted to create a change scale), intention to use and intention to purchase across products. We completed regression analyses, including product type framing condition as predictor, and age, gender, and sexual orientation as control variables employing Bonferroni corrections. **RESULTS:** 26% had no prior experiences with either tobacco or cannabis, 15% only tried cannabis, 16% only tried tobacco, and 44% had experience with tobacco and cannabis. There were no main effects by product frame. However, we found that polysubstance users (of cannabis and tobacco products) reported higher intention to smoke ($\beta = .79, p < .004$) and vape ($\beta = 1.35, p < .004$) tobacco and higher intention to smoke ($\beta = 1.58, p < .004$) and vape ($\beta = 1.43, p < .004$) cannabis than participants with no experience. Participants with only cannabis experience reported higher intention to smoke ($\beta = .97, p < .004$) and vape ($\beta = 1.43, p = .005$) cannabis, while participants with only tobacco experience reported higher intention to smoke ($\beta = .52, p < .004$) and vape ($\beta = .59, p < .004$) tobacco, as compared to participants with no experience. Last, we found higher intentions to purchase products related to vaping ($\beta = .97, p < .004$) and smoking ($\beta = .52, p < .004$) tobacco as well as products related to smoking ($\beta = 1.39, p < .004$) and vaping ($\beta = 1.07, p < .004$) cannabis for polysubstance users as compared to participants with no previous experience. **CONCLUSION:** We do not have significant differences by product. This suggests that we may be able to generalize findings from marketing one substance to another. There is a significant effect of substance use experience, not just for experience with tobacco or cannabis only and the respective behavioral and cognitive outcomes, but also for polysubstance users.



PS4-77

PATTERNS OF CIGARETTE AND E-PRODUCT USE IN ADULTS IN THE UNITED STATES, 2013-2016: MULTISTATE TRANSITION ANALYSIS OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance: As electronic nicotine delivery system (e-product) use changes over time, it is important to understand how adults transition between nicotine products and how sociodemographic characteristics impact transition rates. **Methods:** Using Waves 1-3 (2013-16) of the Population Assessment of Tobacco Health (PATH) study within a multistate Markov model framework, transition rates between never, non-current, cigarette, e-product, and dual user states (defined by ever established use and last 30 day use) in adults (ages 18+) were estimated. Hazard ratios for sex, race/ethnicity, age, education, and income were estimated in univariate and multivariate models. Survey weights were incorporated through importance sampling. **Results:** Rates of transitions from e-product to cigarette use, never to dual use, non-current to dual use, and dual to non-current use were estimated to be negligible. Probabilities of remaining in the same state between waves (i.e. no transition) were high for never (96% (95% CI 94-96%)), non-current (93% (95% CI 92-93%)), and sole cigarette (82% (95% CI 81-83%)) users but low for sole e-product (20% (95% CI 18-22%)) and dual users (37% (95% CI 33-40%)) who primarily transitioned to non-current and sole cigarette use, respectively. There were significant differences in never to e-product initiation rates among never users by sex (male vs. female: 1.4 (95% CI 1.2-1.7)) and age (ages 25-44 vs. ages 18-24: 0.6 (95% CI 0.5-0.8)), but not by race/ethnicity, education, or income. There were significant differences in e-product initiation rates among cigarette users (i.e., transition to dual use) by race/ethnicity (non-Hispanic black vs. non-Hispanic white: 0.6 (95% CI 0.4-0.9); Hispanic vs. non-Hispanic white: 0.6 (95% CI 0.3-0.9)), age (ages 25-44 vs. ages 18-24: 0.5 (95% CI 0.4-0.7); ages 55-74 vs. ages 18-24: 0.3 (95% CI 0.2-0.4)), and educational status (some college vs. high school or less: 1.5 (95% CI 1.2-2.0)), but not by sex or income. **Conclusions:** Many adults who report e-product use (solely or dually with cigarettes) quickly transition to other patterns of use. Understanding trajectories of nicotine use in adults will be essential in projecting how tobacco control public policies will impact these populations.

FUNDING: Federal

PS4-78

ASSOCIATION OF ELECTRONIC AND OTHER TOBACCO USE WITH SUBSEQUENT CIGARETTE SMOKING IN ADOLESCENTS. A CASE-CONTROL ANALYSIS OF PATH DATA.

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Significance: The impact of electronic tobacco products (e-products) such as e-cigarettes or e-hookahs on youth smoking, in particular gateway effects, is contended. Standard observational studies cannot rule out confounding, likely producing biased estimates. This study used a two-pronged case-control approach to address confounding and assess whether use of e-products increases the likelihood of later cigarette smoking. We assessed smoking rates among adolescents with initial e-product use compared with 1) a real-world control group (adolescents with initial non-combustible, non-cigarette tobacco (NNT) use) and 2) a synthetic control group, selected using propensity score matching (PSM) analysis. **Methods:** Data come from the first three waves of the PATH study (2013-2016), a nationally representative, longitudinal cohort survey of the US population. Adolescents aged 12-17 years with no tobacco use at Wave 1 and no cigarette use at Wave 2 with complete data were included (N=5,544; 73% of adolescent sample). Covariates used in PSM (socio-demographics, future smoking susceptibility, environmental tobacco exposure, physical and mental health, problem behaviour, alcohol and drug use, perceptions of tobacco use) were assessed at Wave 1 and exposure (exclusive use of e-products or NNT; combination users were excluded) at wave 2. The main outcome, ever and established cigarette smoking (100+ cigarettes in life-time and at least one in past 30 days), was assessed at wave 3. **Results:** Of tobacco-naïve adolescents at wave 1, 6.4% had initiated e-product use and 0.4% NNT use by wave 2. Ever smoking rates at wave 3 did not differ significantly between e-product and NNT initiators (13.9% vs 21.2%; OR 0.60, 95%CI 0.19-1.95; p=0.391) but e-product initiators were less likely to be established cigarette smokers (0.9% vs 8.0%; OR 0.11; 95%CI 0.02-0.83; p=0.033). By contrast, compared with matched controls without initial e-product use at wave 2, e-product initiators at wave 2 were more likely to have

tried smoking by wave 3 (13.9% vs 3.7%; OR 4.26, 95%CI 2.18-8.32; p<0.001). There was no difference in established cigarette smoking rates (0.9% vs 0%; OR cannot be computed; p=0.092). **Conclusions:** Among tobacco-naïve adolescents, e-product use may decrease the risk of becoming an established cigarette smoker compared with use of other non-combustible tobacco products (the real-world control) but it may increase the risk of ever smoking compared with those matched for a wide range of risk factors who do not initiate e-product use (the synthetic control).

FUNDING: Unfunded; Academic Institution; Nonprofit grant funding entity

PS4-79

ALL NATIONS SNUFF OUT SMOKELESS: A SMOKELESS TOBACCO CESSATION PROGRAM FOR AMERICAN INDIANS

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Introduction: American Indians have the highest rates of smokeless tobacco use of any racial or ethnic group in the United States, yet no proven effective cessation programs exist designed specifically for them. Because tobacco is a sacred plant to many American Indians, programs designed for them must not portray it in a completely negative manner. **Methods:** Based on our successful All Nations Breath of Life smoking cessation program for American Indians, we developed and pilot tested a smokeless tobacco cessation program with 48 American Indian smokeless tobacco users in the Central and Northern Plains. **Results:** A total 48 participants began the program; 33 completed to 6 months, giving us a 68.8% retention rate. Among participants who completed the program, 11 (34%) self-reported abstinence. When those lost to follow-up are considered current users, the cessation rate is 22.9%. Salivary cotinine was collected on the 11 individuals reporting abstinence and 9 provided viable samples. The cotinine verified quit rate was 12.5%; 6 participants were verified tobacco-free, two participants continued to smoke, and one participant self-reported abstinence and had a cotinine level in the current user range. Cigarette smoking and use of traditional tobacco also decreased at endpoint. Smoking cessation was not mandated, but was encouraged. Cessation of traditional tobacco was not encouraged. **Conclusions:** All Nations Snuff Out Smokeless shows promise as a culturally appropriate smokeless tobacco cessation program for American Indians and is ready for testing in a full-scale randomized trial.

FUNDING: Federal

PS4-80

USE OF GOOGLE STREET VIEW FOR TOBACCO ADVERTISING OBSERVATIONS IN DEPOK, INDONESIA

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Background: Google Street View (GSV), a feature of Google Maps provides a street-level view in many cities. Scant research has investigated the accuracy of GSV as a data collection option for observable features in urban environments of low- and middle-income countries (LMIC). We assessed the sensitivity (true positive rate) and specificity (true negative rate) of using GSV to identify exterior tobacco advertising in Depok, Indonesia compared to traditional field observations. **Methods:** A random sub-set of 50 locations each of convenience stores (CS) and independent small grocers (ISG) were selected from a larger sample of 400 locations for assessment using GSV. Exterior photographs and geographic coordinates for each observation were obtained. Photographs taken in the field were used to confirm venues in GSV. Sensitivity (TP/TP+FN) and specificity (TN/TN+FP) of GSV observations were calculated, assuming field observations were correct. **Results:** Two ISGs were unable to be assessed; one could not be located on GSV and another did not have GSV images. GSV had a sensitivity of 38% and specificity of 96% for identifying the presence of tobacco advertising outside of venues, and a sensitivity of 15% and specificity of 95% for identifying whether tobacco product displays were visible from the street. GSV data was inconclusive for identifying the presence of advertising outside 1 venue and identifying product displays from the street for 17. Venues where GSV data were missing or inconclusive were dropped from analysis. **Conclusion:** GSV use in tobacco control is relatively novel in LMICs. Using GSV can be a cost-effective approach compared to more costly field observations. But, using



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GSV without venue locations in advance can be time consuming for researchers. Prior knowledge of the study area or a database of locations should be considered. The high specificity and low sensitivity of using GSV, while in line with prior studies conducted in high income settings, should caution researchers that using GSV does have significant limitations. Images provided by GSV may be unavailable for some stretches of road; outdated and not reflect current conditions; or of insufficient resolution to determine finer details.

FUNDING: Nonprofit grant funding entity

PS4-81

FACES ON THE PACKS: MARKETING BIDIS AND SMOKELESS TOBACCO IN INDIA AND BANGLADESH

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Significance: Tobacco consumption is high in India (28.6%) and Bangladesh (35.3%). Bidis are India's most commonly smoked tobacco product, and are also common in Bangladesh. Smokeless tobacco (SLT) use is more common than smoking in both countries. Bidis and SLT are cheap, and particularly popular among the poor and rural populations. Since 2013, the Tobacco Pack Surveillance System (TPackSS) has been systematically collecting and coding tobacco packs from low and middle-income countries. Initial review of Indian and Bangladeshi bidi and SLT packs revealed that they often include a headshot photo or drawing of a person's face, a branding strategy not seen on cigarettes, nor in other locales. We describe this marketing practice as a first step in understanding its promotional relevance. **Methods:** Indian bidi were collected in 2013, 2016, 2017, and SLT in 2016 and 2017. Bangladesh bidi were collected in 2013 and 2016, and SLT in 2016. Systematic protocols were used to collect unique packs available for sale in diverse contexts. Two coders reviewed packs to identify presence of a headshot face. Further coding for age (adult or child), gender (man or woman) and other noteworthy aspects was undertaken. **Results:** People's faces were prevalent on bidi and SLT in both countries in all data collection years. Of the 572 products collected and coded, 289 (50.5%) included a headshot. People are generally looking straight ahead, and are not smiling; most packs (N=154) include only one headshot, but some packs have as many as six, including one with a headshot on the bidi stick itself. Considering only bidi, 122/165 packs (74.5%) included a face in product branding. Faces portrayed were usually male; 11 (4%) products included depictions of women. Of considerable concern, 24 packs (8.3%) included a child's face, including several babies. **Conclusions:** The inclusion of headshots on bidi and SLT packs in India and Bangladesh is a normative marketing practice, with faces taking up a considerable portion of the available branding space. Further work is necessary to unpack the cultural context of this practice and what such photos or drawings convey to consumers.

FUNDING: Nonprofit grant funding entity

PS4-82

IMPACT OF A GROUP-CENTERED, PHYSICAL ACTIVITY-FOCUSED TOBACCO CESSATION PROGRAM ON SMOKING OUTCOMES FOR WOMEN IN RESIDENTIAL TREATMENT FOR SUBSTANCE USE DISORDER

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Significance: Smoking prevalence among women in substance use disorder (SUD) treatment is high, and tobacco cessation is associated with an increased likelihood of maintaining long-term sobriety; yet less than half of SUD treatment centers offer tobacco treatment services. Physical activity has potential as a smoking cessation strategy due to its association with quit attempts, smoking abstinence, and moderation of cravings. The purpose of this study was to examine the impact of a group-centered, physical activity-focused tobacco cessation program on smoking outcomes for women in residential treatment for SUD. **Methods:** Preliminary analysis was conducted on a prospective, longitudinal study of the 8-week Get Fit and Quit (GFAQ) program. Data was collected at 3 time points: enrollment, week 4, and week 8. Participant surveys, administered via iPad, included measures of demographics, cigarettes smoked per day (CPD), nicotine dependence (Fagerstrom Test for Nicotine Dependence), and confidence ratings (0-10) and importance ratings (0-10) for quitting. Expired Air Carbon Monoxide (EACO) was measured using the Bedfont Micro+™ Smokerlyzer®. SAS version 9.4 was used, with

an alpha of 0.05. **Results:** Forty-two women (4 cohorts, average age of 33) completed the program. The majority self-identified as white (83%), single (67%), and unemployed (95%), with highest education ≤high school degree/GED (55%). Significant differences were observed from enrollment to week 4 and from enrollment to week 8, respectively: Average CPD decreased from 13.5 (enrollment) to 9.4 (week 4) and 6.8 (week 8) ($p<0.01$; $p<0.01$); EACO levels decreased from 19.9 ppm to 16.0 ppm and 16.2 ppm ($p<0.01$; $p=0.02$); mean nicotine dependence scores decreased from 5.3 to 4.0 and 3.4 ($p<0.01$; $p<0.01$); and confidence ratings in ability to quit smoking increased from 4.4 to 5.6 and 6.5 ($p=0.01$; $p<0.01$). Additionally, importance ratings for quitting smoking increased from 6.7 (enrollment) to 7.4 (week 4) and 7.4 (week 8) ($p<0.01$; $p=0.06$). **Conclusion:** A group-centered tobacco cessation program that includes physical activity has promise in helping women in recovery for SUD move towards tobacco cessation.

FUNDING: State; Other

PS4-83

EMOTIONAL HEALTH FACTORS ASSOCIATED WITH SMOKING CESSATION IN A SAMPLE OF ROMANIAN PREGNANT WOMEN

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Background: In Romania around 30% of women smoke tobacco before pregnancy and 15% continue smoking during pregnancy. Maternal smoking adverse health consequences for both the mother and the baby. Identifying the emotional health variables associated with smoking cessation can help in developing interventions that address this unhealthy behavior. **Methods:** A total of 143 questionnaires were collected from April 2016 to January 2017 during the formative research phase of the Quit Together intervention focusing on smoking cessation during pregnancy. The data collection settings included one private and two public obstetrics and gynecology clinics located in Cluj-Napoca. The questionnaire was divided into five sections focusing on women's socio-demographics, medical and reproductive history, alcohol use and tobacco smoking, emotional health and the relationship with the life partner. Bivariate correlations and multivariate regression were used to identify the emotional health variables associated with smoking cessation during pregnancy. **Results:** The mean age of the participants was of 28.90 years (range 18-46). Self-esteem was positively correlated with smoking cessation ($r=.224$, $p=.01$). Higher education was correlated with smoking cessation ($r=0.433$, $p<.01$). Married women were more likely to quit smoking than unmarried women who lived with a partner ($r=.233$, $p=.01$). Conclusion: Higher self-esteem was associated with increased smoking cessation during pregnancy. Other emotional health variables, including depression and anxiety symptoms and pregnancy-related anxiety were not correlated with smoking cessation. The results emphasize on the importance of developing smoking cessations interventions focused on increasing self-esteem.

FUNDING: Federal

PS4-84

HELPING PEOPLE LIVING WITH HIV QUIT SMOKING: WHAT WORKS?

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Objectives: To examine smoking patterns, barriers to quit, and views about potential smoking cessation interventions among people living with HIV (PLWH). **Methods:** We conducted a cross-sectional survey among PLWH current cigarette smokers ($n=162$; 50.6% females; mean age [SD] = 51.6 [9.98] y; response rate 77.9%) in the University of Miami HIV registry. Interviewer administered questionnaires inquired about smoking patterns, barriers to quit, drug and alcohol use, and views about several smoking cessation interventions (e.g., individual/group counseling, contingency management, mindfulness), their intensity (brief, intensive) and delivery modes (e.g., in-person, smartphone app, Internet). Descriptive analyses of main study indices were tabulated and differences by gender were assessed using Chi-square tests and between-group t-tests. **Results:** Most participants were Black (70.4%), unemployed/disabled (48.8%), with less than high school education (55.0%), less than \$10,000 of income per year (80.2%), and daily smokers (74.7%). Nicotine dependence levels were "high" in 32.7% of participants, 26% had moderate to severe depression, and 40.1% reported risky alcohol use. Compared



to females, males were significantly more likely to smoke cigars/cigarillos (OR=5.06, 95%CI: 2.28-11.22; $p<0.001$) and marijuana without tobacco (OR=2.15, 95%CI: 1.04-4.26; $p=0.039$). The most reported barriers to quit smoking were managing craving (46.3%), cost (25.3%), having a partner who smokes (25.3%) and traumatic life events (23.5%). The most attractive smoking cessation interventions were in-person group training in meditation (88.3%) for stress management (72.2%) and craving for cigarettes (73.5%), and receiving cash rewards to quit smoking (45.7%). **Conclusions:** PLWH have a complex psychosocial profile with psychiatric and socioeconomic challenges (e.g., poverty, drug use) that may undermine their smoking cessation efforts. Mindfulness-based and contingency management smoking cessation interventions were of special interest among this sample of PLWH. More studies are needed to investigate the feasibility and potential efficacy of such interventions.

FUNDING: Academic Institution

PS4-85

ACCULTURATIVE STRESS, ANXIETY SENSITIVITY, AND SMOKING AMONG SPANISH-SPEAKING LATINX ADULT SMOKERS

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Significance: Although acculturative stress is a known individual difference factor related to poor Latinx health, little is known about its relationship to smoking among Latinx adults. One transdiagnostic factor that may serve an explanatory role in the relation between acculturative stress and smoking is anxiety sensitivity. The current study evaluated anxiety sensitivity in the relations between acculturative stress and smoking among a large sample of adult Spanish-speaking Latinx smokers. **Methods:** Participants were 359 Spanish-speaking Latinx daily smokers (58.8% female, $M_{age} = 33.2$ years, $SD = 9.7$). **Results:** There were statistically significant indirect effects of acculturative stress via anxiety sensitivity in relation to cigarette dependence, perceived barriers for quitting cigarettes, and severity of problems during past quit attempts. **Conclusions:** The present findings provide novel evidence that greater acculturative stress is related to anxiety sensitivity, which in turn, is associated with clinically significant smoking processes.

FUNDING: Unfunded

PS4-86

INFORMING TOBACCO CESSATION INTERVENTIONS FOR HOMELESS AND UNSTABLY HOUSED WOMEN

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SIGNIFICANCE: Smoking prevalence is disproportionately high in persons experiencing homelessness. Women bear higher smoking-related burdens such as heart disease and, when combined with poverty and homelessness, the impacts of smoking are detrimental. In this context, few cessation programs target homeless and unstably housed women (HUHW). To help guide the design of tailored cessation programs, we sought to identify HUHW-specific factors associated with smoking. **METHODS:** We recruited a probability sample of HUHW from San Francisco homeless shelters, free meal programs, low-income hotels and street encampments to participate in a prospective study regarding the use of tobacco and other substances. Data collection occurred monthly for six months between June 2016 and January 2019. Current smoking was defined as any self-reported tobacco use in the prior month or urinary cotinine >10 ng/mL. **RESULTS:** Among 247 participants, the median age was 53 years (range: 25-75), 74% were ethnic minority, 49% had elevated symptoms of depression, 61% had symptoms consistent with PTSD, and most used other substances (64% alcohol, 60% cannabis, 66% cocaine or methamphetamine, 33% opioids). Seventy-five percent of participants currently smoked and 89% of smokers had at least one prior 24-hour quit attempt. Regarding other nicotine products, 13/13 current nicotine patch users and 21/22 e-cigarette users/vapers were current smokers. Factors significantly associated with current smoking included younger age, non-Caucasian race, use of all other substances, current symptoms of depression and current PTSD. Uniquely related to homelessness, 41% of participants smoked to decrease appetite when there was not enough to eat and 41% used tobacco to reduce other substance use. Impulsivity and estrogen level were not significantly associated with smoking. **CONCLUSIONS:** Few populations have rates of smoking or mental illness this high. Most HUHW smokers had a history of quit attempts but failed. Cessation programs

targeting HUHW may need to prioritize housing assistance, food provision and mental health services to engage and retain these vulnerable smokers long enough to achieve smoking cessation.

FUNDING: Federal; State

PS4-87

COST-EFFECTIVENESS OF FINANCIAL INCENTIVES FOR LOW-INCOME EXPECTANT MOTHERS WHO SMOKE TO ENGAGE IN TOBACCO CESSATION TREATMENT

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SIGNIFICANCE: Smoking during pregnancy is a leading preventable cause of negative health consequences to both mother and infant. While financial incentives increase smoking treatment engagement and abstinence, little is known about the cost-effectiveness of financial incentives to elevate smoking abstinence rates among low-income women during and after pregnancy. **METHODS:** The First Breath study was a randomized trial for Medicaid recipients who smoked during pregnancy to receive up to \$500 for attending 6 prenatal visits, 4 postpartum visits, 5 postpartum counseling phone calls and for biochemically verified tobacco abstinence at 1-week and 6-months postpartum. Control group participants could receive \$80 for attending 1-week and 6-month postpartum visits. Incremental cost per smoker was determined by computing incentives received, staff time, resources used and smoking cessation medications reimbursed through Medicaid postpartum. Incremental effectiveness was determined through biochemically-verified tobacco abstinence at 6-month postpartum visit. Incremental cost-effectiveness, or cost per smoker who quit, was calculated as the weighted sum of the individual pathways for each study arm based on the proportion of women receiving from 0 up to 15 intervention contacts. **RESULTS:** The study enrolled 515 incentive group participants and 509 controls. Mean age was 26.4 years. 46% were white, 38% black or African American, and 5% Hispanic. 24% were married or living with a partner. 54% of the incentive group attended all 4 scheduled postpartum visits and 42% completed all 5 postpartum counseling calls compared to 30% and 14%, respectively, for controls. 6-month postpartum abstinence was 34.7% in the incentive group and 18.1% for controls ($p<0.001$). Total cost was \$740 per incentive group participant and \$559 per control, for an incremental cost of \$181. The incremental cost-effectiveness ratio was \$1,090 per additional smoker who quit. **CONCLUSIONS:** The study results show that providing financial incentives to low-income pregnant women who smoke is a cost-effective means to increase evidence-based tobacco treatment engagement and smoking abstinence in the postpartum period.

FUNDING: Federal

PS4-88

SMOKE-FREE COMPLIANCE AND NONCOMPLIANCE IN NATIONAL PARKS IN THAILAND

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Background: In Thailand, although the public and tourists have generally accepted bans on smoking in public indoor spaces, smoking in public outdoor spaces remains normative because outdoor spaces are seen as the last refuge for smokers. In 2017, Thailand passed a law prohibiting smoking in all parks nationwide to reduce exposure to secondhand smoke (SHS), reduce contamination from tobacco product waste (TPW), and reduce fire hazards. This study aimed to determine the impacts of the new law. **Methods:** We selected 14 popular national parks and historic monuments in Central and Northern Thailand and assessed enforcement and compliance. We systematically scanned park entrances, parking lots, and attractions to observe "no smoking" signage and smoking behavior. We collected and photographed all TPW items. We then counted, classified, and mapped signage, incidents of smoking, and TPW to identify where no-smoking rules were being observed and violated. **Results:** All 14 parks posted small "no smoking" signs, but only a few emphasized smoke-free policies. Inconsistent with the law, some parks provided designated smoking areas. Smoking was observed in all 14 parks, particularly among staff. TPW collected at the 14 sites totaled 11,186 items,



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ranging between 194-1,116 per site, varying by site size and number of visitors. Mapping revealed that no-smoking rules were generally observed in core areas, particularly where educational signage was prominent. Violations occurred primarily beyond invisible perimeters where smokers sensed they were out of view of officials, particularly at parking lots, restrooms, benches, and picnic areas. **Conclusion:** Smoking is being controlled but remains a problem in national parks and monuments in Central and Northern Thailand. Educational and evocative signage informing visitors that smoking produces SHS, TPW contamination, and fire hazards, and is therefore prohibited in all park areas, should be posted strategically at gates, parking lots, and perimeter areas. Visitors should be informed before purchasing tickets about why smoking is banned. Park staff who smoke should be offered smoking cessation support, and should be required to quit smoking.

FUNDING: State

PS4-89

EFFECTS OF NICOTINE STRENGTH ON DEMAND FOR NICOTINE VAPING PRODUCTS (NVP) IN EXCLUSIVE CIGARETTE SMOKERS AND DUAL SMOKERS/NVP USERS

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Significance: Tobacco product purchase tasks allow experimental manipulation of various tobacco product characteristics, such as nicotine vaping product (NVP) nicotine strength, and examination of how users value these characteristics. In the present, ongoing study, we are investigating the impact of nicotine strength on NVP demand. **Methods:** Sixty three adult tobacco users ($n = 35$ exclusive cigarette smokers and $n = 28$ dual smokers/NVP users) received a study e-cigarette (Joyetech Exceed D19) and sampled four different e-liquid strengths (3, 6, 12, and 24 mg/mL) over a seven-day period. Participants returned to the laboratory to complete e-liquid purchase tasks, in which they reported the quantity of each e-liquid strength they would like to purchase across a range of prices (\$0.12 - \$8.00 per mL). **Results:** Results reveal that e-liquid demand is significantly positively associated with nicotine strength, with the highest levels of demand observed at the 24 mg/mL strength ($p < .01$). This effect does not differ by tobacco user type (exclusive smoker vs. dual user). Additional data to be collected. **Conclusions:** Valuation of NVPs increases with nicotine strength. Implication of this effect for NVP regulation will be discussed. Future research should investigate these effects across a broad range of nicotine strengths and NVP devices. Data will also be interpreted in light of a unit price model of drug demand, in which differences in demand between a drug available at different doses may be explained by differing prices per drug dose.

FUNDING: Federal

PS4-90

A CIGARETTE CONSTITUENT CAMPAIGN'S INFLUENCE ON QUITLINE AWARENESS AND USE: A RANDOMIZED CONTROLLED TRIAL

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Significance: The Food and Drug Administration (FDA) is required to communicate the health risks associated with chemicals in cigarette smoke (i.e., constituents) to the public. While FDA has undertaken campaigns aimed at preventing tobacco use and encouraging smokers to quit, few messages have contained information about cigarette constituents, and no research exists on their impact. We conducted a randomized controlled trial examining whether messages about cigarette smoke constituents influence quit intentions among adult smokers. Secondary outcomes addressed whether an FDA media campaign focused on cigarette constituents can increase awareness, recall, or use of Quitlines. **Methods:** 789 US adult cigarette smokers received daily messages through an online platform each morning for 15 days. Participants were randomized to one of three message format conditions: 1) cigarette constituent messages (featuring arsenic, ammonia, lead, formaldehyde, and uranium) with FDA source and text about quitting ("engagement" condition), 2) constituent-only messages, without the FDA source and text about quitting, ("constituent-only" condition) or 3) a control condition with messages about not littering cigarette butts. Follow-up surveys were conducted on days 16 and 32. Secondary RCT outcomes reported include awareness and recall of the Quitline, intention to use the Quitline, and use of the Quitline measured at post-test 1 on day 16. **Results:** Participants were 61% female, 73% white, and 91% non-Latino. Compared to smokers that received the control messages about littering, smokers who received cigarette constituent messages including FDA source and text about quitting were more likely

to answer 'yes' that they know the national phone number to call for help to quit smoking. Smokers who received messages with text about quitting were more likely than smokers who received messages without text about quitting and smokers who received messages about littering to correctly recall the national quitline number (1-800-Quit-Now). Analyses show no difference by group in terms of intention to use or use of the Quitline at post-test 1. **Conclusions:** A short-term campaign about harmful chemicals in cigarette smoke that includes encouraging information about and resources for quitting can increase quit intentions and knowledge of the Quitline phone number. These results can inform national efforts to communicate about harmful constituents in cigarette smoke in ways that motivate smoking cessation.

FUNDING: Federal

PS4-91

DISCRETIONARY SPENDING PRIORITIES AMONG JOB-SEEKING SMOKERS

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Significance: Tobacco use is costly for physical and financial wellbeing. Smoking is associated with unemployment and a harder time finding re-employment. The current study examined job-seeking smokers' prioritization of smoking over other basic life needs. **Methods:** Job-seeking smokers ($N=290$) ranked items from 1 (highest) to 13 (lowest) for prioritization of their discretionary spending. The online survey randomly ordered the presentation of items. **Results:** With a mean score of 4.7 ($SD=3.1$), cigarettes ranked second in importance behind only food ($M=2.5$, $SD=2.7$); 45% of the sample ranked tobacco in their top 3 spending priorities. Nicotine replacement therapy was ranked the lowest. Job-seeking resources (e.g., cell phone, transportation, grooming, new clothing) ranked between 3 to 6 on average, prioritized less than food and cigarettes, but higher than other items (e.g. medical treatment, alcohol). Participants in precontemplation were more likely to rank tobacco in their top 3 (55%), compared to those in contemplation (37%) and preparation (44%), $X^2=2.69$, $df=2$, $p=.032$. Those who smoked within 30 minutes upon waking (50%) were more likely to rank cigarettes within their top 3 priorities, compared to those who smoked after 30 minutes (33%), $p<0.05$. Heavier smoking was associated a greater prioritization of tobacco ($r=-0.21$, $p<0.01$) and less prioritization of food ($r=0.16$, $p<0.01$). More past year quit attempts was significantly associated with less prioritization of tobacco ($r=0.16$, $p<0.01$). **Conclusions:** Findings indicate tobacco is highly prioritized, second only to food in discretionary spending, among job-seeking unemployed smokers. Cigarettes were prioritized over job-seeking and healthcare needs, particularly among more heavily addicted smokers. Helping job-seekers quit smoking would increase resources for job-seeking and other basic life needs. This work was supported by the State of California Tobacco Related Disease Research Program (TRDRP) Research Award #24RT-0035.

FUNDING: State

PS4-92

EFFECTIVENESS OF LONG-TERM ENGAGEMENT IN SMOKING CESSATION AMONG SAMPLE IN ONTARIO, CANADA

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Objectives: To assess the effectiveness of long-term engagement (LTE) in achieving positive cessation outcomes and to explore smokers' engagement with LTE. **Methods:** A sample of 1631 current and recent smokers aged 18 years and over participated in a 12-month randomized study in Ontario, Canada. Intervention group participants ($n=816$) received 11 monthly emails containing a brief smoking status poll and links to cessation services; control group participants ($n=815$) did not receive any emails. At baseline, 65% of participants reported being a current smoker (63% intervention group and 67% control group). A 12-month follow-up survey containing questions about smoking and quitting behaviours, and experiences with the LTE intervention was completed by 1,093 study participants. Analyses included: descriptive statistics to explore the intervention group's engagement with the monthly emails and repeated measures logistic regression to assess changes in smoking status between the intervention and control groups at follow-up. **Results:** Among the intervention group, 97% opened at least one monthly email, 93% responded to at least one monthly poll, and 17% clicked on at least one cessation service link in the monthly emails. About a quarter of the intervention group opened all



11 monthly emails (30%) and answered all 11 monthly polls (25%). Intervention group participants reported that the monthly emails helped them to think about quitting (41%), stay smoke-free (24%), cut down on smoking (23%) and make a quit attempt (22%). Regression analyses revealed no significant difference between intervention and control group smoking status at follow-up (current smoking: 55% intervention group vs. 59% control group; odds ratio 0.8474, $p = 0.1283$). **Conclusions** Our study findings suggest that smokers remained engaged throughout the 12-month intervention period and that LTE assisted smokers to consider quitting, reduce consumption, make quit attempts and prevent relapse. However, this study did not find a significant association between LTE and positive smoking outcomes. Further study should investigate different types of LTE messages to improve long-term cessation outcomes.

FUNDING: Other

PS4-93

COLLEGE STUDENT RESPONSE TO JUUL MARKETING MESSAGES

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Significance: College student e-cigarette use has increased rapidly, primarily through JUUL use. The study objective was to test marketing messages for college student JUUL users. **Methods:** A sequential explanatory mixed methods study used an online survey of undergraduates ($n=668$) who used a JUUL at least once a week in March 2019 with follow up interviews ($n=51$) conducted in April. The survey presented three types of messages: **tobacco industry** (A device inside my JUUL can communicate how I use my JUUL to the manufacturer, JUUL is manufactured by the tobacco industry that also makes cigarettes), **harm to self** (JUULing with nicotine changes my brain in an unhealthy way, JUULing with or without nicotine damages my lungs), and **harm to others** (JUUL pods are damaging the environment by creating a lot of plastic that is not recycled, The vapor you exhale is harmful to others). Chi square test examined associations between cigarette ever use (yes/no) and responses to JUUL marketing messages (no change in JUUL use vs make me want to reduce or quit JUUL use). Interview participants explained their survey responses, which were analyzed for themes. **Results:** College student JUUL user (50% female, mean age 20.3 years) responses were significantly associated with ever smoking. For both harm to brain and harm to lungs messages, more never smokers responded this would make them JUUL less or quit than ever smokers (brain $X^2=4.34$, $p=.04$; lungs $X^2=9.08$, $p=.01$). More never smokers said knowing that JUULs were damaging the environment would make them JUUL less or quit than ever smokers ($X^2=9.02$, $p=.01$). Never smokers had a higher level of agreement that JUUL vapor is harmful to those around them than ever smokers ($X^2=6.35$, $p=.03$). Most participants said tobacco industry association with JUUL would not change their use; but agreement was higher for ever smokers ($X^2=24.67$, $p=.0001$). Interview participants found messages about unhealthy effects on the brain and harm to the environment to be the most motivating to reduce or quit JUULing. **Conclusions:** JUUL prevention messages should be targeted to issues meaningful to college student JUUL users and targeted differently by smoker group.

FUNDING: State; Academic Institution

PS4-94

USING LATENT CLASS ANALYSIS TO IDENTIFY PATTERNS OF TOBACCO AND CANNABIS USE AMONG ADOLESCENTS

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Background: Poly-use, or the use of 2 or more tobacco and cannabis products, is common among youth, but the rapidly increasing variety of products that are on the market has made it challenging to characterize patterns of use and co-use. Latent class analysis (LCA) can be used as a data reduction technique to identify the most salient use patterns across various tobacco and cannabis products. We aimed to (1) identify classes of adolescents based on tobacco and cannabis products that were used in the past 6 months, and (2) evaluate the associations between demographics and mental health factors and class membership. **Methods:** Data are from a prospective cohort study in which students were enrolled from 10 public high schools in the Los Angeles, CA, USA area. Analyzed data included 2,989 students who completed the survey in Fall 2016 (11th grade) and provided data on past 6-month use of 2 tobacco and 5 cannabis products: cigarettes, e-cigarettes, combustible cannabis, vaporized cannabis, edible cannabis, blunts and dabs. LCA was used to identify classes of participants based on products used within the past 6 months. **Results:** 4 classes were identified (Entropy: .936): (1) Non-Users ($n= 2333$, 78.1%);

(2) Combustible Cannabis and Blunt Users ($n=425$, 14.2%); (3) Poly-Users of All Tobacco and Cannabis Products ($n=140$, 9.7%); (4) Cannabis Products-Only Users ($n=91$, 3.0%). Compared to Non-Users, Combustible Cannabis and Blunt Users were less likely to be Asian and more likely to be Multiracial, used most tobacco and cannabis products more frequently, and were more likely to report symptoms of major depressive disorder (MDD) on the Revised Children's Anxiety and Depression Scale. Poly-Users (vs. Non-Users) were more likely to be male, White, report more frequent use of all tobacco and cannabis products, and report symptoms of MDD. Cannabis Products-Only Users were substantially more likely to be Hispanic, reported more frequent use of all cannabis products, and were more likely to report symptoms of MDD. **Conclusion:** Further research examining underlying mechanisms of co-use among youth may inform regulatory policies and prevention strategies that can aid in reducing the adverse effects associated with poly-product use.

FUNDING: Federal

PS4-95

METHOD TO INCREASE THE PRECISION OF NATIONAL YOUTH TOBACCO SURVEY (NYTS) ESTIMATES TO FACILITATE DERIVATION OF RATES AND COMPARISONS BETWEEN POPULATION SUBGROUPS

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Prevalence estimates are the most referenced surveillance metrics for youth smoking, especially in media reports. However, it can be challenging to infer how the policy environment at any given moment is affecting smoking behavior from trends in prevalence. Comparisons of prevalence across time for a given age group do not disentangle the impact of cohort replacement, and so an observed trend might be primarily driven by past policies that set the entering cohort on a different trajectory than the departing cohort. For this reason, rate metrics that are analogous to incidence (e.g. initiation rate) provide a more valid indicator for assessing the impact of the policy environment on youth smoking at a given point in time. Unfortunately, derivation of raw rate metrics usually entails a reduction in precision that may render the observed trend in rates to be too noisy to interpret. Subgroup estimates of prevalence are often very noisy as well due to smaller sample sizes. For school-based samples, much of the imprecision results from the relatively low number of schools and classrooms that are surveyed in a given year. I propose a method for adjusting National Youth Tobacco Survey (NYTS) estimates to improve the accuracy and precision of rate metrics by utilizing retrospective information. Backward-looking questions allow for the derivation of certain population parameters multiple times, once for each applicable survey year. Comparing estimates of equivalent parameters—i.e. prevalence for a given population at a given time—across multiple survey years can then be used to assess the magnitude and direction of sampling error for each survey year relative to other survey years. Adjusting initiation rate or prevalence among subgroups by incorporating retrospective information to estimate and remove this survey-year specific sampling error can substantially improve the precision of these metrics, allowing for analysis of year-to-year trends that would otherwise be very difficult to interpret due to statistical noise.

FUNDING: Unfunded

PS4-96

REDUCING SMOKING AND ENVIRONMENTAL TOBACCO EXPOSURE DURING AND AFTER PREGNANCY: RESULTS OF THE BABY'S BREATH TRIAL

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Introduction: Baby's Breath is a multicomponent intervention to decrease environmental tobacco smoke (ETS) among pregnant smokers or ETS exposed non-smokers. **Methods:** Eligible participants, recruited from low-income serving prenatal clinics spoke English, were 18 years or older; were smokers, quitters or smoke-exposed; did not have a multiple gestation pregnancy; had access to a working telephone and video player; and were not more than 16 weeks pregnant. Intervention participants received five tailored videos delivered at 16, 24 and 34 weeks gestation, and at 2 and 14 weeks postpartum; a video for a household or other close smoker; and eight newsletters. Comparison group participants also received eight newsletters containing no tobacco content. Newsletters were mailed to both groups throughout pregnancy, and 16 and 26 weeks postpartum. Primary outcome measures included: maternal and infant salivary



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cotinine, self-reported smoking status, and ETS exposure and avoidance. Process measures of video and newsletter use were collected by telephone survey. Results: No differences were found in smoking cessation or differences in maternal salivary cotinine. Among non-smokers, cotinine among control group infants was significantly higher (3.06 ng/ml) compared with intervention group infants (2.26 ng/ml, $p=.0337$). Dose analysis demonstrated a relationship between use of intervention components and main outcomes. Dose analysis demonstrated a relationship between use of intervention components and main outcomes. Discussion: The Baby's Breath intervention assisted in ETS avoidance among non-smokers, but not ETS avoidance or cessation among smokers. Baby's Breath demonstrates that a low-intensity ETS avoidance intervention can be effective among low-income, pregnant non-smokers.

FUNDING: Federal

PS4-97

ASSOCIATION OF DIGITAL MEDIA USE AND SUBSEQUENT TOBACCO AND CANNABIS PRODUCT USE INITIATION AMONG ADOLESCENTS

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BACKGROUND AND SIGNIFICANCE: Cannabis and alternative tobacco product use (e.g., e-cigarettes) are increasing among adolescents. Exposure to digital media - including social media and marketing - may be associated with increased risk of initiation, but this has not been thoroughly evaluated. **METHODS:** 2,089 adolescents who never used cannabis or tobacco products ($M_{age}=16.5$, $SD=.01$) completed self-report questionnaires as part of a prospective cohort study of adolescents in Los Angeles, CA, high schools. Data were obtained across 2 years beginning when participants started 11th grade (baseline), with 6, 12, and 18 month follow-up. Digital media use was assessed through self-reported use of 14 digital media activities; 6 classes of digital media exposure were identified through factor analysis ("social media posting"; "checking in"; "online browsing"; "chatting and shopping"; "gaming"; and "music"). Adjusted repeated measures logistic regression models were used to examine the association of exposure to digital media with subsequent initiation of cannabis or tobacco product use in the following 6-months. **RESULTS:** High frequency use of both "social media posting" items (vs. no high frequency use) was associated with greater odds of cannabis use initiation 6 months later (OR=2.06; 95% CI: 1.29-3.29). High frequency use of both "checking in" items was associated with greater odds of cannabis use initiation (OR=1.85; 95% CI: 1.36-2.53) and greater odds of any tobacco use initiation (OR=2.63, 95%CI: 1.74, 3.98). High frequency use of both "online browsing" items was associated with decreased odds of cannabis (OR, 0.53; 95% CI, 0.35-0.79) and tobacco use initiation (OR, 0.53; 95% CI, 0.29-0.96). Other factors were not associated with odds of product use initiation at follow-up. **CONCLUSION:** Different types of digital media use were associated with varying odds of cannabis and tobacco use initiation, with some factors conferring increased odds, others conferring decreased odds, and others not associated with initiation. Research is needed to examine distinct modalities of digital media use and potential mechanisms underlying the association of digital media with substance use.

FUNDING: Federal; State

PS4-98

ASSOCIATION BETWEEN PREFERENCE FOR ALCOHOL BEVERAGE-NAMED E-LIQUIDS AND ALCOHOL USE AMONG HIGH SCHOOL YOUTH

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Background: There are thousands of e-liquid flavors available, and some of them are named after alcoholic beverages (e.g., "pina colada"). It is unclear whether use of alcohol-named e-liquids is associated with adolescent alcohol use. Given that there is evidence of e-cigarette and alcohol co-use in adolescents, it is important to investigate associations between preference for using alcohol named e-liquids and alcohol use behaviors among youth. **Methods:** Data were collected from 8 Southeastern Connecticut high schools in Spring 2015 (N=7045). The current analyses focused on a subsample of 1311 youth who were e-cigarette ever users and had data on both past-month alcohol drinking (no past month alcohol use, past month alcohol use but no binge drinking, and past month binge drinking) and e-liquid flavor preference (i.e. alcohol, candy, fruit, etc.). **Results:** 8.0% (N=111) of adolescent ever e-cigarette users preferred alcohol-named

e-liquids and had consumed alcohol drink. Past-month alcohol use was categorized into three levels: 30.6% had no past month alcohol use, 19.8% had past month alcohol use but did not binge drink in the past month, and 49.5% binge drank in the past month. The univariate analysis showed a significant association between past month drinking and preference for alcohol-named e-liquids ($X^2=25.54$, $p<.0001$). Multinomial logistic regression (controlling for demographics and other e-cig flavors that were highly endorsed, i.e., fruit and candy) revealed that past month binge drinking compared to no past month alcohol use was associated with preferences for alcohol-named-e-liquids (OR: 2.84, CI: 1.70-4.75), fruit flavored e-liquids (OR: 1.55, CI: 1.14-2.11) but not candy flavored e-liquids (OR: 1.22, CI: 0.87-1.70) **Conclusions:** This evidence suggests that the preference for alcohol-named e-liquid flavors is associated with alcohol past-month binge drinking among adolescents. Further longitudinal studies are needed to understand the directionality of this relationship.

FUNDING: Federal

PS4-99

USER ENGAGEMENT WITH MOOD RELATED CONTENT ON AN ONLINE SMOKING CESSATION RESOURCE

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Background: Smoking is often perceived as a mood regulation strategy, which can create barriers to smoking cessation. People increasingly use online smoking cessation resources, and resources that address mood and smoking can contribute to cessation outcomes. This study aimed to quantify interactions with mood-related content on smokefree.gov—a publicly-available smoking cessation website created by the National Cancer Institute. **Methods:** Smokefree.gov website analytics data collected between January 2018 and June 2019 were analyzed to assess user interactions with mood content. We examined engagement with the following content: informational stress and depression web pages, mood-related interactive quizzes, mood-related smoking triggers in user-generated smoking quit plans, and embedded links to the suicide hotline. Standard website performance metrics (e.g., page views, time on page) were used to assess user engagement with web pages. Other metrics were quiz completions, reported mood-related triggers on quit plans, and total clicks to the suicide hotline. **Results:** Views of informational mood pages (N=254,745) comprised 2% of all smokefree.gov page views (N=17,449,619). Approximately 53% of total mood page views were depression pages, and 47% were stress pages. The most viewed depression page was "Smoking and Depression" (77% of depression page views), and the most viewed stress page was "Coping with Stress Without Smoking" (45% of stress views). Mood quizzes represented over 80% of all quiz completions (mood and non-mood), with 919,603 depression quizzes and 5,401 stress quizzes completed. Over 40,000 quit plans were completed, and mood-related triggers were among the most commonly endorsed trigger types. Stress was a reported trigger on 95% of quit plans. Links to the suicide hotline on mood pages received 2,865 clicks. **Conclusions:** Interactive, mood-related smokefree.gov content, such as mood-related quizzes and quit plan triggers, were often utilized. Informational page views represented a small percentage of total smokefree.gov page views, suggesting opportunities for optimization of these pages and integration of further interactive mood content.

FUNDING: Federal

PS4-100

FLAVORANTS AFFECT THE TOXICITY OF WATERPIPE TOBACCO SMOKE MEASURED BY CELLULAR AND ACELLULAR METHODS

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Significance: Continued popularity of waterpipe tobacco smoking, especially among younger demographic groups, supports investigating the relative safety of this lifestyle choice. Flavors are a known enticement for smoking initiation and a concern regarding smoke toxicity. Our study evaluates the relative toxicity of Waterpipe Tobacco Smoke (WTS) generated from different flavors using cellular and acellular methods. **Methods:** The cytotoxicity of WTS was measured using a smoking apparatus optimized to model WTS impacting lung cells at the air-liquid interface (ALI). L2 cells (type II pneumocytes) were seeded at 10^6 cells per Transwell filter and exposed to ambient air or smoke generated by charcoal heating shisha from six flavors categories (Spice, Fruit, Menthol, Candy, Citrus and Vanilla) following the standard Beirut smoking protocol with a medium pipe (36cm) and Tygon® 2375 hose (183cm). After a 24hr recovery period with the ALI maintained, the treatments' effects were analyzed using two cell viability metrics, membrane



permeability (Fluorescein diacetate cleavage) and lysosomal function (Neutral red dye uptake, NRU). WTS particulate from parallel smoking sessions was collected on filters, extracted and analyzed for a) oxidative potential (OP) using the acellular dithiothreitol (DTT) assay and b) differences in chemical composition using liquid chromatography/mass spectrometry (LCMS). **Results:** Citrus shisha smoke caused negligible damage. Exposure to menthol, fruit, and menthol+fruit shisha smoke resulted in the most cell death with >30% decreases in lysosomal activity and 65-95% decreases in membrane permeability. WTS particulate from fruit and spice flavors resulted in a higher OP than menthol and vanilla in the DTT assay. LCMS analysis found the highest number of compounds unique to the spice flavor and a significant number in fruit that were not present in menthol and vanilla. **Conclusions:** Our data indicate whole shisha smoke generated from shisha flavors have differential effects on smoke toxicity with flavors that are the most popular with new smokers causing the highest level of oxidative potential and cell death.

FUNDING: Federal; Academic Institution

PS4-101

A TRAUMA-INFORMED APPROACH TO CESSATION USE AMONGST UNSTABLY HOUSED WOMEN LIVING IN URBAN ENVIRONMENTS

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INTRODUCTION: Homeless adults are five times more likely to use tobacco than the general population, and tobacco-related deaths amongst the marginally housed occur at double the rate of those who are stably housed. Despite these increased risks, smoking cessation is rarely prioritized in the care of homeless populations. While trauma is a known risk factor for smoking, few tobacco cessation programs incorporate a trauma-informed approach. **METHODS:** This qualitative analysis is drawn from 30 in-depth interviews with current and former female smokers with a history of homelessness, who were participants in a prospective study regarding influences of substance use on cardiac dysfunction. In our sampling, we aimed to include women with diverse substance use histories. Interviews were double-coded using grounded theory methods and analyzed with Atlas.ti software. **RESULTS:** Participants characterized the nature of their tobacco use while unstably housed. Most reported smoking more while experiencing homelessness, however, some recalled smoking less due to lack of resources. In addition to stressors and triggers linked with interpersonal contexts, which are recognized in the general population, participants identified stressors uniquely linked to homelessness. These included: risks or trauma associated with sex work, interactions with police, threats of violence, theft, physical pain from sleeping on the streets, and financial concerns. Most participants felt individually responsible for the success or failure of their cessation efforts, rather than pointing to structural barriers to quitting. At the same time, nearly all participants stated that stressors faced while living on the street made it impossible quit smoking. **CONCLUSION:** A trauma-informed approach to cessation may be promising to appropriately acknowledge the social context of this high-risk population. At the same time, given the low rates of successful quitting amongst homeless adults and the structural barriers described by these participants, housing services must be prioritized within cessation programs targeted at this population.

FUNDING: Federal; State

PS4-102

CHARACTERISTICS, MOTIVATIONS, PATTERNS, AND TRENDS OF DAILY E-CIGARETTE USE AMONG 14-17 YEAR-OLDS

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To help inform policy and prevention, we used EMA to examine daily context, characteristics, motivations, and patterns of e-cig use among 50 adolescent vapers, ages 14 to 17, in Kentucky. An initial survey assessed demographics and e-cig use and perceptions while daily surveys over two weeks (700 observations) obtained real-time data on e-cig use, motivations, and environmental context. Overall, 64% vaped nicotine before the age of 15, 90% reported it was easy to obtain nicotine e-liquid, 33% reported past month dual-use with tobacco cigarettes, and 22% reported dual-use with cigars. Over the two-week EMA, adolescents exclusively used e-cigs on 44% of days, dual-used with tobacco cigarettes on 9% of days, and concurrently-used (any tobacco product use within two hours of vaping) on 12% of days. On average, youth vaped nicotine 7 times per day with 6 puffs per occasion. The highest e-cig use occurred on a Saturday with

an average of 11.4 occasions (consisting of an average 82 total puffs). The lowest e-cig use occurred on a Monday with an average of 4.4 occasions (consisting of an average 28 total puffs). Adolescents typically vaped with their own device (55% of occasions); vaped high nicotine content (18mg or higher; 46%); vaped with flavors (86%); vaped socially (70%); and vaped in their home (48%). The most common reasons for vaping included: feels good (83% of occasions), like the flavors (75%), tobacco is prohibited (61%), boredom (59%), and like doing vape tricks (48%). On 47% of days, adolescents reported intentions to vape the next day. We used multi-level models with daily observations nested within individuals to examine use patterns. Results showed e-cig use and concurrent use with other tobacco was highest on weekends, and that next day vaping intentions were greater as the week progressed and then decreased by mid-weekend. Results of this study help inform FDA priorities by investigating e-cig use patterns and context among adolescents, a critically important population when considering public health impact and FDA regulation.

FUNDING: Federal

PS4-103

THE EFFECT OF PREFERRED FLAVOR AND TOBACCO-FLAVORED PODS ON SUBJECTIVE EXPERIENCES, PUFFING BEHAVIOR, AND NICOTINE LEVELS AMONG YOUNG ADULT JUUL USERS

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Significance: JUUL has become the most popular e-cigarette device used by youth and the leading brand in the market. This appeal is mostly attributed to its sleek design and the availability of flavors. Evidence of the effects of limiting flavor on JUUL users' experiences and behavior is lacking. This pilot study evaluates the impact of JUUL flavor manipulation on user's puffing behavior, subjective vaping experience, harm perception, and nicotine exposure among college-aged participants. **Methods:** A total of 26 young adults (18-24 yrs.) who self-reported vaping JUUL regularly (weekly or more often) attended two 60-minute ad-libitum JUUL vaping sessions (preferred flavor vs. classic tobacco flavor) in a cross-over design study. Puff topography was measured throughout the vaping session, while plasma nicotine concentrations were collected before and after the vaping sessions. All participants completed questionnaires assessing their subjective experiences. **Results:** Participants reported enhanced subjective smoking measures of satisfaction, taste, enjoyment, urges to vape, pleasure, product appeal, motivation/interest/willingness to use the product in the future, and increased concentration following the preferred flavored JUUL session compared to the tobacco flavor (p -values <0.05). While nicotine levels increased in both groups over time, no significant differences were observed in post session or total nicotine boost levels, as well as on puff topography or harm perception measures. **Conclusions:** This pilot study is the first to explore the effects of JUUL flavor manipulation on users' subjective experiences, nicotine levels, and puffing behavior. Our findings indicate that JUUL flavors have a substantial effect on enhancing users' experiences, product appeal, and motivation to vape in the future. Regulating pod flavors of USB-shaped e-cigarettes such as JUUL can be a promising strategy to curb e-cigarette use among youth in the US.

FUNDING: Academic Institution

PS4-104

ASSOCIATION BETWEEN EXPOSURE TO THE TIPS CAMPAIGN AND RELAPSE TO CIGARETTE SMOKING AMONG RECENT QUITTERS

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Significance: Studies have shown that the Centers for Disease Control and Prevention's national *Tips from Former Smokers*® (*Tips*®) campaign is associated with quit attempts and smoking cessation among adults who currently smoke. However, the impact of the campaign on preventing relapse among adults who formerly smoked has not been examined. **Methods:** The analytic sample included respondents who reported currently smoking at the beginning of the study and then reported no smoking for two or more consecutive waves thereafter (3 to 6 months). The final analytic sample included 1,353 adults aged 18 years and older who recently quit smoking and completed at least three consecutive surveys for measuring relapse. We defined relapse as having



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formerly smoked for two or more survey waves and reporting current smoking in a later data collection cycle. We used logistic regression to model relapse on cumulative past-quarter market-level *Tips* gross ratings points (GRPs), a measure of ad exposure dose. All models were weighted and controlled for demographics, state fixed effects, and other individual characteristics associated with smoking. **Results:** Among adults who recently quit smoking, 50.5% reported relapse. *Tips* GRPs were associated with significantly lower odds of relapse to cigarette smoking (aOR=0.66, 95%CI: 0.53-0.81). Among all other assessed variables, reporting that most friends and/or family smoked was the only variable associated with significantly higher odds of relapse (aOR=2.61, 95%CI: 1.90-3.59). **Conclusion:** Exposure to the *Tips* campaign was associated with lower odds of relapse to smoking among adults who recently quit. These results suggest that in addition to promoting quit attempts and cessation among adult smokers, *Tips* may also play a role in preventing relapse among adults who have recently quit smoking.

FUNDING: Federal

PS4-105

USING EXPERIMENTAL AUCTIONS TO DETERMINE INCENTIVE LEVELS FOR SMOKING CESSATION A PILOT STUDY

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Background: Incentive-based smoking cessation interventions increase quit rates, however the optimal incentive level or dissemination strategy has yet to be determined. We evaluated the feasibility and effectiveness of using a willingness-to-accept auction (WTA) for one week of smoking cessation in addition to the cost per quit. Allowing smokers to name the amount they would need to receive provides a more accurate estimate of the incentive needed to motivate a smoker to quit. **Methods:** Two phases were conducted. In phase 1, smokers ready to quit (n=10) evaluated the WTA auction instructions, participated in a hypothetical auction, and provided related feedback. In Phase 2, smokers ready to quit (n=35) participated in a WTA auction whereby they named the amount between \$0 and \$100 that they needed to be paid to quit for one week. Individuals won the auction if a random draw was greater than their stated price. Winners received the randomly drawn amount if they quit smoking for one week. Smokers were also provided a one-week supply of nicotine replacement therapy and a brief cessation counseling session. Carbon monoxide level was monitored remotely 3 times during the quit week and in person at the final session. **Results:** Phase 1 qualitative results supported the removal of a portion of the auction instructions. In Phase 2, participants who smoked their first cigarette within 5 minutes of waking bid significantly more in the auction than those who waited (p < .05). Among auction winners, 45% quit smoking for one week compared to only 13.3% of individuals who lost the auction (p < .05). Moreover, the cost per quit (accounting for study and cessation incentives, supplies) for those who won the auction, and received an incentive for quitting, was \$466 compared to \$894 for those who did not win the auction. **Conclusions:** WTA auctions may be an effective way to approximate the amount smokers need to be paid to quit, which would allow researchers to estimate the most cost-effective payment to offer as part of incentive-based smoking cessation programs. Replication evaluating long-term cessation outcomes with larger samples is warranted.

FUNDING: Academic Institution

PS4-107

HOW INDONESIAN MEDIA PORTRAY ELECTRONIC CIGARETTES: A CONTENT ANALYSIS OF ONLINE NEWS REPORTS FROM 2012-2017

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Background Electronic cigarettes (e-cigarettes), of which the health effects are deemed as less harmful than traditional cigarettes, have been sold in Indonesian market since 2010. We sought to examine the portrayals of e-cigarettes in online news media as they have been the new main source of information among Indonesians. **Materials and Methods** A content analysis was conducted on all news report published by four most popular online news media in Indonesia from 2012 to late 2017. The news reports were obtained by both search methods; within the media websites, and through the Google advance search. The reports were reliably coded for topics of the story, news

source, and coverage of benefits and harms of these products. **Results** Of the 418 articles found mentioning e-cigarettes, only 320 articles (76.6%) focused specifically on e-cigarette issues and were included in the analysis. The dominant topics of those articles were regulation or policy updates, and health effects of e-cigarettes (26.6% and 21.6% respectively); while the dominant news sources were scientist/researcher (34.7%) and government officials/policy makers (30.3%). Framing of e-cigarettes are equally or more harmful than traditional cigarettes appeared in 126 articles (39.4%); while framing of e-cigarettes are not harmful or less harmful than traditional cigarettes were used in 63 articles (19.7%). Over time, e-cigarettes were portrayed more negatively (70.9% of total articles) with a sudden three-fold increase in the number of articles published from 2016 to 2017. **Conclusion** The outnumbering negative frames of e-cigarette indicated that the online news media tried to tell the public to oppose these products. However, the tendency of dominantly portraying the negative effects of e-cigarettes are in contrary with the increasing use of electronic cigarettes in Indonesia. Future research investigating the political economy of media may obtain deeper understanding on how online news media produce their stories

FUNDING: State

PS4-108

HOMELESS WOMEN'S PERSPECTIVES ON SMOKING CESSATION PROGRAMS

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INTRODUCTION: Despite the increased risks of both smoking and tobacco-related illnesses amongst homeless women, there are currently no cessation programs designed specifically to meet the needs of this population. In order to aid the development of such targeted programs, we sought homeless women's experiences with and perspectives on cessation programs. **METHODS:** This qualitative analysis draws from 30 in-depth interviews with current and former female smokers with a history of homelessness, who were participants in a prospective study regarding substance use and cardiac dysfunction. We conducted targeted sampling to include women with diverse substance use and housing histories. Interviews were double-coded using grounded theory methods and analyzed with Atlas.ti software. **FINDINGS:** Participants described their successes and failures with various forms of cessation programs. Many were resistant to participate in programs because of their desire to socially isolate in order to maintain their safety, especially those who had lived in an environment where psychological abuse including threats and coercion were common. Some named a strong resistance to authority based on prior negative experiences as impeding their willingness to participate in a cessation program. While the majority of participants expressed a desire to quit, few were optimistic about how helpful a cessation program would be in assisting them with this goal, a sentiment often based on the need to prioritize safety and well-being. Of those participants who had been successful in their cessation efforts, many pointed to the encouragement that they received from a clinician outside of the cessation program as being instrumental in their success. **CONCLUSIONS:** Trauma-informed smoking cessation programs for homeless women that address challenges associated with housing instability as part of the cessation process and include off-site options for participation may be more successful than those that require consistent participation in a group.

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PS4-109

PREVALENCE AND CORRELATES OF USE OF JUUL RELATIVE TO OTHER NICOTINE PRODUCTS AMONG COLLEGE STUDENTS

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Background: The rapid increase in youth e-cigarette use appears to be due to Juul, yet few studies have examined whether Juul-only users differ those who concurrently use Juuls and other e-cigarette brands or from those who use multiple nicotine products, including cigarettes. This study examined the factors associated with being a current user in each of these groups among a sample of college students. Correlates of trying Juul as the first nicotine product were also assessed. **Methods:** Data were analyzed from a cross-sectional sample of US-based college students (n=1,096) who completed an anonymous online survey in April-May 2019. Logistic regression was used to assess the correlations between sociodemographic characteristics, sensation seeking, and family use of e-cigarettes or tobacco and trying Juul first, among respondents who had ever tried any nicotine product (n=696). Multinomial logistic regression was used to assess correlates of Juul-only use vs. concurrent Juul/e-cigarette or e-cigarette only use vs. concurrent use of cigarettes and Juuls/e-cigarettes among current Juul and/



or e-cigarette users (n=308). Results: Of the 64% of respondents that had ever tried any nicotine product, 25% had tried Juuls first. Trying Juuls first was correlated with being younger and female. Higher sensation seeking and having family members that use cigarettes or e-cigarettes decreased the odds of trying Juuls first. Of the 29% of current Juul and/or e-cigarette users, 55% were Juul-only users, 19% were concurrent Juul/e-cigarette (n=44) or e-cigarette only users (n=14), and 26% used cigarettes in addition to Juuls/e-cigarettes. Compared to concurrent cigarette users, Juul-only users were significantly more likely to be female, have parents with higher education levels, have lower sensation seeking, and were less likely to currently use marijuana. There were no significant differences between e-cigarette/Juul users and concurrent cigarette users. Conclusions: Study results suggest that Juuls may attract youth with lower risk for trying other types of nicotine products, such as being female, having lower sensation seeking, no current marijuana use, and no family use of nicotine products.

FUNDING: Academic Institution

PS4-110

PREVALENCE AND PREDICTORS OF E-CIGARETTE AND MENTHOL CIGARETTE DUAL USE AMONG ADULTS IN THE UNITED STATES: THE NATIONAL HEALTH INTERVIEW SURVEY, 2015

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Background: While research has shown that female, non-Hispanic Black (NHB), and younger smokers are more likely to use menthol cigarettes than male, non-Hispanic White (NHW), and older smokers, investigation of concurrent use of menthol cigarettes and other tobacco products, and their sociodemographic patterning, is limited. **Methods:** We examined prevalence and predictors of six categories of use—non-current use, non-menthol cigarettes only, menthol cigarettes only, e-cigarettes only, e-cigarette/non-menthol cigarette dual use, and e-cigarette/menthol cigarette dual use—using data on adults aged 18+ from the 2015 National Health Interview Survey (n=32,019). We assessed sociodemographic predictors of use patterns among the full sample and in a subset of dual users (n=855), using adjusted multinomial logistic regression and logistic regression, respectively. **Results:** Nearly 84.2% of the sample was non-current users, 7.7% non-menthol cigarette users, 3.4% menthol cigarette users, 2.1% e-cigarette users, 1.9% e-cigarette/non-menthol cigarette dual users, and 0.7% e-cigarette/menthol cigarette dual users. In adjusted models, compared to non-current users, e-cigarette/non-menthol cigarette dual users had lower odds of being female vs male (OR: 0.59, 95% CI: 0.47-0.72) and NHB vs NHW (OR: 0.13, 95% CI: 0.07-0.24), while e-cigarette/menthol cigarette dual users had higher odds of being female vs male (OR: 1.52; 95% CI: 1.06-2.17) and lesbian, gay or bisexual vs heterosexual (OR: 2.12, 95% CI: 1.06-4.23). Both dual use groups had lower odds of being Hispanic vs NHW, being more vs less educated, and having higher vs lower household income. In adjusted models, compared to e-cigarette/non-menthol cigarette dual users, e-cigarette/menthol cigarette dual users had higher odds of being female vs male (OR: 2.90; 95% CI: 1.83-4.58) and NHB vs NHW (OR: 8.98; 95% CI: 4.28-18.82). **Conclusions:** E-cigarette/non-menthol cigarette and e-cigarette/menthol cigarette dual use differ by sociodemographic factors. Understanding concurrent use of menthol cigarettes and other tobacco products may inform cessation interventions and the public health impact of a menthol ban.

FUNDING: Federal

PS4-111

JUUL ELECTRONIC CIGARETTES NICOTINE EXPOSURE AND THE USER EXPERIENCE

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Significance. As of March 2019, JUUL electronic cigarettes were the most popular e-cigarette on the U.S. market, but little is known of nicotine exposure and dependence on JUUL. **Methods.** From May 2018 to January 2019, JUUL users were recruited within the city of San Francisco, California. Participants completed the Penn State Electronic Cigarette Dependence Index, a qualitative interview, and a saliva collection for cotinine (a major metabolite of nicotine). **Results.** 15 participants were enrolled; 12 males, 3 females; 53% White; average age=29.8 years; 60% were dual users with tobacco cigarettes; 40% were exclusive JUUL users. On average dependence scores were low to moderate (average=7.5), and similar for dual vs. exclusive JUUL users.

Qualitative interview themes included the importance of social networks in adoption and use of the product; use of product reinforced by device features such as small size and small vapor cloud; satisfaction with the product compared to a tobacco cigarette; and a perceived sense of addiction to the product. Cotinine levels were on average geometric mean=90 ng/mL for dual users and geometric mean=172 ng/mL for exclusive JUUL users. **Conclusions.** JUUL e-cigarettes expose users to levels of nicotine similar to other e-cigarettes, but may be more satisfying due to unique device features. Self-reported dependence on JUUL was similar to other studies of electronic cigarette users. The JUUL product may be acceptable to tobacco cigarette smokers who are seeking to quit. However, it holds addictive potential and can reinforce long-term nicotine use.

FUNDING: Federal; Nonprofit grant funding entity

PS4-112

CURRENT SMOKING AND SUSCEPTIBILITY TO SMOKING AMONG ADOLESCENTS WORLDWIDE EVIDENCE FROM 95 COUNTRIES IN THE GLOBAL YOUTH TOBACCO SURVEY, 2013-2017

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Objective: The first aim was to estimate the prevalence of both current smoking among adolescents, and susceptibility to smoking among never-smoking adolescents in 95 countries. The second aim was to identify protective and risk factors associated with smoking and susceptibility to smoking among global youth. **Method:** Cross-sectional data for 95 countries were obtained from the Global Youth Tobacco Survey (GYTS) between 2013 and 2017, which was completed by 341,184 (weighted N=54,232,701) adolescents aged 13-15 years (47.8% males and 52.2% females). Complex survey procedures were used to estimate prevalence of smoking and susceptibility to smoking. Separate multiple logistic regression models explored predictors of current smoking and smoking susceptibility. All analyses accounted for the complex sampling design and weights to yield nationally representative estimates. **Results:** Worldwide, 8.1% of 13-15 year olds reported currently smoking cigarettes (range=0.0% to 32.5%) and another 13.3% of never-smoking adolescents were susceptible to smoking (range = 0.9% to 41.1%). Both current smoking and susceptibility to smoking were significantly elevated among men, older adolescents, those with greater exposure to second-hand smoke at home, and those with greater exposure to tobacco industry promotion (particularly for women). Endorsing indoor or outdoor smoke-free policies was associated with lower smoking and susceptibility rates, in contrast. In addition, exposure to anti-tobacco messages at school and at social activities was significantly protective against smoking susceptibility among never-smoking adolescents, but was not significantly related to current smoking. Male adolescent susceptibility to smoking was reduced by anti-tobacco school education to a greater extent than among female adolescents. **Conclusions:** Gender, age, attitudes, and environmental exposure to tobacco marketing and counter marketing are related to both current smoking and susceptibility to future smoking in a global survey of 13-15 year old adolescents. Tobacco marketing may have a greater impact on female adolescents, whereas counter marketing and education may have a greater impact on male adolescents.

FUNDING: Unfunded

PS4-113

RECRUITMENT OF LATINOS FOR A MOBILE SMOKING CESSATION CLINICAL TRIAL

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INTRODUCTION: Routine identification of smokers during medical encounters might provide an avenue for recruiting Latino smokers into cessation studies, but strategies for engaging these smokers have not been systematically tested. **OBJECTIVE:** To assess enrollment of Latinos in a mobile smoking cessation randomized clinical trial via two recruitment modalities (text and call). **METHODS:** Eligible participants were identified via electronic medical records of Latino smokers seen at the Emergency Department (ED) of a large metropolitan hospital in the previous year (n=1,689) and a Federally Qualified Health Center (FQHC; n=176). Participants were contacted via phone call (4 attempts) or text message (6 attempts) in English and Spanish. Text message content included messages on social norms, scarcity, and threats to health due to smoking.



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Outcomes included response to the text message, answering the phone call, interest in participating in the study, eligibility to participate in the smoking cessation clinical trial, and study enrollment. We also assessed the best day of the week and time of day to recruit Latino smokers via text or call. **RESULTS:** Phone calls were answered by 53.6% and 41.2% of patients on the FQHC and the ED List, respectively. The response rate via text was 20% and did not vary by text message content or list. Best time to reach participants varied by modality, with most participants answering calls on Wednesdays and Saturdays between 9 am - 12 pm and texts on Tuesdays between 12 pm - 2 pm. Among those who responded, the eligibility rate via text was 10 - 12% for both lists while the eligibility rate via call was 5.7% for the FQHC list and 11.5% for the ED list. Among those who were eligible, enrollment rate was nearly the same via text or calls, with 50% - 65% enrolling for both lists. Overall enrollment rate from all participants contacted was 1.3% via texts and 2.2% via calls for both lists. **CONCLUSION:** Recruiting ethnic minorities via electronic medical records is feasible, although the yield is low. Text messages have a slightly lower yield, but require less resources than making calls, and may be more cost-effective. **FUNDING:** NIH R01CA212189

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PS4-114

HOOKAH (WATER PIPE) USE AMONG SEXUAL MINORITY ADULTS IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY WAVE 1 (2013-2014) AND WAVE 2 (2014-2015)

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Significance Tobacco smoking using a hookah (water pipe) is a new global epidemic. Contributing to hookah's popularity is the erroneous belief that smoke is detoxified as it passes through water. Individuals who identify as lesbian, gay and bisexual (LGB) have higher odds of hookah use compared to heterosexuals. While studies utilizing nationally represented data have focused on cigarettes use among sexual minority adults, little is known on hookah. The purpose of the study was to characterize hookah use and examine comparisons between sexual minority adults and their heterosexual counterparts in a nationally represented sample. Methods Data were drawn from Wave 1 (2013-2014) and Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health Study, a nationally representative sample of U.S. adults aged ≥ 18 years. Weighted analyses estimated prevalence of hookah use among sexual minority adults versus their heterosexual counterparts and examined comparisons on socio-demographic characteristics, co-use of substances—alcohol and cannabis—and mental health perceptions. **Results** LGB ever hookah use (Wave 1: 29%; Wave 2: 31%) was higher than heterosexuals ever hookah use (Wave 1: 16%; Wave 2: 16%; $P < 0.05$). Similarly, current hookah use among LGB (Wave 1: 4%; Wave 2: 3%) was higher than heterosexuals use (Wave 1: 1%; Wave 2: 1%; $P < 0.05$). LGB respondents had a higher prevalence of cannabis use than heterosexuals ($p < 0.05$), with higher rates reported among LGB women hookah users (odds ratio [OR], 2.28; 95% CI, 1.21-4.28) (Wave 2). Compared with heterosexuals, LGB current hookah users reported lower odds of excellent mental health (OR, 0.37; 95% CI, 0.21-0.68); and higher odds of being bothered by emotional problems such as feeling anxious, depressed or irritable in past 7 days (OR, 0.34; 95% CI, 0.23-0.51) (Wave 1). **Conclusion** Hookah use is higher among LGB adults, especially LGB women, than heterosexuals. Given hookah's rapid growth, these findings highlight the importance of gender-based approaches to inform tobacco control policies specific to hookah. Interventions must take into account mental health symptomatology, which may complicate tobacco prevention and cessation.

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PS4-115

LINKS BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND MATERNAL SMOKING DURING PREGNANCY

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Significance: Maternal smoking during pregnancy (MSDP) remains a major public health problem in the US and worldwide. Causal links have been established between MSDP and low birthweight and prematurity. In order to develop novel intervention targets, it is critical to find predictors of MSDP. A small number of recent studies have examined maternal history of adverse childhood experiences (ACEs) in relation to MSDP in the context of multiple risk behaviors during pregnancy. In the present study we focus specifically on links between maternal history of ACEs and MSPD during pregnancy. **Methods:** Participants were 289 diverse, low income, pregnant women from

two cohorts oversampled for MSDP (mean age=25, 59% minorities). MSDP was assessed from 3 months preconception through delivery via Timeline Followback interview and confirmed with saliva cotinine. Women reported on their history of ACEs from birth to age 18 via a 20-item ACEs scale. Presence/absence of physical neglect, emotional neglect, physical abuse, emotional abuse, sexual abuse, and witnessing domestic violence were derived from this scale. **Results:** Preliminary findings indicated that participants who reported childhood emotional or sexual abuse were significantly more likely to smoke during pregnancy relative to those who did not ($\chi^2 = 6.96, 7.29; p < .03$). Presence of ACEs also predicted level of MSDP. Specifically, presence of childhood physical neglect, emotional abuse, or sexual abuse were associated with greater total cigarettes smoked over pregnancy ($f_s > 1.95; p < .03$). Further, presence of childhood physical neglect also predicted higher number of cigarettes smoked per day ($t = 2.17; p = .031$, mean cigarettes per day = 8.7 vs. 7.0). **Conclusion:** Results extend prior studies showing associations between ACEs and multiple risk factors to a specific focus on MSDP, including levels of MSDP and highlight the need for further research into maternal history of ACEs and patterns of MSDP and other substance use in pregnancy. Findings also have implications for identification of women at highest risk for MSDP and novel targets for prevention and intervention efforts.

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PS4-116

FROM HEALTH TO NIGHTLIFE: AN ANALYSIS OF MENTHOL MARKETING FROM 2009 - 2018

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Significance: The 2009 Tobacco Control Act (TCA) placed restrictions on tobacco marketing and banned flavors in cigarettes, excluding menthol. Menthol makes starting smoking easier, increases addiction and makes quitting more difficult. The tobacco industry has marketed menthol to African Americans, women, and young people, who all smoke menthols at higher rates than the general population. Menthol ads historically focused on the health benefits of menthol, but less is known about present-day marketing strategies. We analyzed menthol cigarette ads following the passage of the TCA from 2009 through 2019 to document contemporary marketing of menthol cigarettes. **Methods:** A descriptive content analysis was conducted on 250 menthol cigarette ads obtained from the Rutgers University Trinkets & Trash repository. The sample was comprised of ads for the three most popular menthol cigarette brands: Newport, Marlboro, and Camel. Two trained coders coded ads for imagery, text descriptors, potential health or reduced risk claims, ad/package color and the existence of coupons or prizes. **Results:** Many ads focused on images of young people engaging in social activities, particularly nightlife and parties. Images often included sexual themes and urban cityscapes. Ads frequently depicted African Americans, or a group of racially diverse individuals. Ads across all three brands contained references to the "crisp", "cool", and "fresh" properties of menthol. Almost all ads from Newport and Marlboro included the words "pleasure" or "night," respectively. Most ads were green, blue or black, and newer products included words like "select" and "platinum." **Conclusions:** Contemporary menthol ads rely on language and colors that continue to emphasize menthol's sensory properties. Although ads may no longer explicitly suggest a healthier product, current marketing depicts populations that smoke menthols at higher rates and includes imagery that may be appealing to young people. Because menthol cigarettes present a significant public health threat, ongoing monitoring of tobacco industry marketing practices is warranted.

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PS4-118

TOBACCO: OPINION OF THE FRENCH, RESULTS OF A TEN YEARS LONGITUDINAL STUDY

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The Cancer Barometer led by the French National Cancer Institute and Santé Publique France is the first nationally representative longitudinal French study of perceptions of cancer and tobacco. Our study aims to: (1) investigate French citizens' representations of cancer risk and tobacco and their evolutions from 2005 to 2015 and (2) study the factors associated with these representations. In this national telephone longitudinal survey, the data were collected in representative samples of the French population at 3 periods (2005 n=3736, 2010 n=3392, 2015 n=3817). A list of 8 propositions for investigating representations on tobacco consumption was submitted to the samples. Chi² tests were carried out to study the various associations and logistic regressions to identify sociodemographic variables associated with participants' perceptions. About



32% of the participants smoked (current and daily smokers); this rate was equal to the general population; and 75% believed smoking certainly increased cancer risk. French people believed "breathing city air is as bad for health as smoking": 70.6% in 2015 against 64.6% in 2010 ($p < 0.001$). More people also believed "some people can smoke all their life without ever getting cancer": 80.4% in 2015 against 74.1% 5 years earlier and 68.4% in 2005 ($p < 0.001$). However, fewer French people believed "smokers can avoid cancer by stopping in time" (59.0% in 2015, 62.3% in 2010, 70.1% in 2005; $p < 0.05$). Finally, the share who believed "smoking can only cause cancer if you smoke heavily for a long time" was down from 37.9% in 2010 to 33.7% in 2015 ($p < 0.01$). 70% believed "sport helps to clean the lungs". Participants less perceiving cancer risk attributed to tobacco use were regular smokers (OR=0.70), elders (OR=2.22), executives and higher intellectual professions (OR=0.59). No significant differences were observed according to smoking status, sex and socio-professional status. Opinions of smoking show an increasing distance among people who see it as banal, with the young and lower income and diploma levels having with the weakest perception of cancer risk due to tobacco. Policies have been developed in France to target these people and their impact is being evaluated. The next Cancer Barometer could serve to assess their impact. Finally, these results propose ways for interventional research.

FUNDING: State

PS4-119

LONGITUDINAL PATTERNS OF CONVENTIONAL CIGARETTE, ELECTRONIC CIGARETTE, AND DUAL USE DURING PREGNANCY AND POSTPARTUM

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Significance: Various studies have been published on the prevalence of smoking during pregnancy, but few have longitudinally assessed patterns of single and dual product use (i.e., e-cigs and cigarettes) across multiple timepoints in pregnancy and postpartum. This information can help define the impact of various nicotine product combinations on prenatal outcomes and identify opportunities for cessation interventions. The purpose of this study was to describe patterns of conventional (conv) cigarette and e-cig use among pregnant/postpartum women. **Methods:** Preliminary analysis of a multi-site prospective study using quota sampling was conducted. Pregnant women, aged 18-44, with current use of conv cigarettes, e-cigs, or both (dual use) were enrolled between 8-14 weeks gestation (Visit 1). Three subsequent visits were completed: 20-26 weeks gestation, 30-36 weeks gestation, and 2-8 weeks postpartum. At each visit, conv cigarette/e-cig use type was determined via self-report (electronic survey) and validated by Expired Air Carbon Monoxide analysis. **Results:** One hundred and forty-eight women completed all 4 study visits. Nearly half (47%) of the women exhibited switching behaviors over the course of the study, with 35 different switching patterns observed. Almost half (43%) of the "switchers" changed their behavior 2 times over the 4 visits. Dual (57%) and e-cig only (80%) users, classified by type at enrollment, were more likely than conv-only (37%) users to switch use type at a subsequent visit. Five percent, 10%, and 8% of participants denied any use type (i.e. "quit") at visits 2, 3, and 4, respectively, yet only 4% of participants reportedly sustained their quit after enrollment. Of those that reportedly "quit" at a visit, the majority (60%) were conv-only users, as compared to dual (15%) and e-cig only (25%) users, in the visit directly preceding the quit. **Conclusion:** In recognizing the propensity for cigarette and e-cig switching among pregnant and postpartum women, it is imperative that future research examines single and multiple product use throughout pregnancy, not just at one time-point, as well as the effects of switching on prenatal outcomes.

FUNDING: Federal

PS4-120

THE PREVALENCE OF TOBACCO USE AMONG WOMEN WHO USE ORAL CONTRACEPTIVES IN JORDAN

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Significance: The use of Oral Contraceptive Pills (OCPs), a common method of birth control, has been associated with higher risk of cardiovascular disorders, such as myocardial infarction, pulmonary embolism and venous thromboembolism, especially among women who use tobacco products. OCPs use is also associated with faster nicotine metabolism, which may lead to higher smoking intensity, greater rewarding

effects of nicotine, greater cravings and withdrawal symptoms, and worse smoking cessation outcomes. Little, however, is known about the scale of tobacco use among women who use OCPs and the sociodemographic characteristics associated with such use. This study was conducted to estimate the prevalence of current tobacco use, namely waterpipe, cigarette, and dual use, among women who use contraceptives in Jordan utilizing the Jordan Demographic and Health Survey 2017-18 (DHS) dataset and to characterize tobacco use among this population by sociodemographic variables. **Methods:** A secondary data analysis of Jordan 2017-18 DHS Survey, which was designed to collect data on family planning and maternal and child health, was conducted. The Survey collected data from a nationally representative sample of over 47,000 ever-married women 15-49 years old between 2017 and 2018. All married, non-pregnant, women who self-reported to use OCPs were included in the analyses (N=3,968). **Results:** The prevalence of overall OCPs use was 14.4% (3,968 out of 27,485). The prevalence of overall tobacco smoking, regardless of type, was 6.6%. The prevalence estimates of cigarette-only, waterpipe-only, and dual use were 3.0%, 1.9%, and 1.6%, respectively. The prevalence of tobacco use among OCP users increased with age, social class (Wealth Index and education), and in urban areas. **Conclusion:** smoking ratings among Jordanian women who use OCPs are high in Jordan. The effect of wealth and education on cigarette smoking and waterpipe smoking holds different perspectives and concepts. Different forms of interventions are crucial, through both prenatal care services and national tobacco use policies.

FUNDING: Unfunded; Academic Institution

PS4-121

SOCIODEMOGRAPHIC PATTERNS OF POLYTOBACCO USE AMONG U.S. YOUTH: A COMPARISON OF THREE NATIONALLY REPRESENTATIVE SURVEYS

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Background: The use of multiple tobacco products, polytobacco use, is increasingly common among U.S. youth due in part to a dynamic tobacco marketplace. With the increase in polytobacco use, sociodemographic disparities in tobacco use are of concern. This study presents sociodemographic patterns of polytobacco use among U.S. youth using multiple national surveys. **Methods:** We analyzed three national youth surveys: the 2017 National Youth Tobacco Survey (NYTS), the 2017 Youth Risk Behavior Surveillance (YRBS), and the Population Assessment of Tobacco and Health (PATH) Wave 3 (2015-2016). Tobacco products were classified into four groups: 1) conventional cigarettes; 2) electronic nicotine delivery systems (ENDS: e-cigarettes, e-cigars, e-pipes, vape pens, vaping pens, e-hookahs, and hookah pens); 3) other combustible tobacco (cigars, cigarillos, filtered cigar, pipe, hookah, or bidis); and 4) smokeless tobacco (snus, chew, snuff, dip, or dissolvable tobacco). We created 16 possible categories of non/single/polytobacco use using the four product groups and calculated the weighted prevalence for each category by gender and race/ethnicity (all surveys) and parental education and household income (PATH) based on variable availability. **Results:** Data from 16,195 middle and high schoolers in NYTS (high schoolers: 57.7%), 12,448 high schoolers in YRBS, and 11,533 middle and high schoolers in PATH (high schoolers: 62.3%) were analyzed. Prevalence of polytobacco use (used two or more products during the past 30 days) ranged from 0.5%-1.9% among middle schoolers and 3.6%-10.9% among high schoolers across the surveys. The most prevalent polytobacco use category was use of ENDS with other products. Polytobacco use was more common in male and non-Hispanic White youth than female youth and those from other racial/ethnic groups, respectively. In terms of socioeconomic status, polytobacco use was more common in youth with lower household incomes and parental education than those with higher household incomes and parental education. **Conclusion:** Understanding sociodemographic patterns of polytobacco use is helpful to prepare appropriate strategies to prevent tobacco use in U.S. youth.

FUNDING: Federal



PS4-122

IMPLEMENTATION OF ASK-ADVISE-CONNECT IN A SAFETY-NET HEALTH SYSTEM: DIFFERENTIAL EFFECTIVENESS AMONG SPANISH- VERSUS ENGLISH-SPEAKING SMOKERS

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PURPOSE The reach of quitline-delivered treatment is low among Spanish-speaking smokers, and long-term efficacy is unknown. This study is a secondary analysis of a 34-month implementation trial that evaluated Ask-Advise-Connect (AAC) in 13 community clinics serving low-income, racially/ethnically diverse patients in Houston, TX. AAC involves training clinic staff to Ask every patient about their smoking status, Advise all smokers to quit, and offer to directly Connect smokers with quitline treatment through an automated link within the electronic health record (EHR). The current analysis examined differences in treatment enrollment, counseling dose received and cessation outcomes among smokers who received treatment in Spanish versus English. **METHODS** Outcomes included quitline treatment enrollment, counseling dose received and six-month abstinence rates (self-reported and biochemically confirmed). **RESULTS** The smoking status of 218,915 patients was recorded in the EHR, and 46.6% were documented as having Spanish as their preferred language. Approximately 11% of Spanish-speaking smokers and 12.1% of English-speaking smokers enrolled in treatment. Median number of calls completed was 2 for those who received treatment in Spanish vs. 1 for those who received treatment in English. Abstinence rates among Spanish-speaking smokers were higher than among English-speaking smokers (self-reported 25.1% vs 14.5%; biochemically confirmed 7.6% vs. 3.7%). Those who received treatment in Spanish were twice as likely to be abstinent at six months (self-reported: OR: 1.98; 95% CI: 1.62, 2.40; biochemically confirmed: OR: 2.13; 95% CI: 1.52, 2.97). **CONCLUSIONS** Streamlined, automated approaches such as AAC have great potential to reach and enroll Spanish-speaking smokers in tobacco treatment. Once enrolled, those who received treatment in Spanish (vs. English) demonstrated better treatment engagement and better cessation outcomes.

FUNDING: State; Nonprofit grant funding entity

PS4-123

CAUSAL RELATIONSHIP BETWEEN E-CIGARETTE USE AND SUBSEQUENT CIGARETTE INITIATION AMONG U.S. YOUTH: A PROPENSITY SCORE ANALYSIS USING DATA OF THE PATH STUDY

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Significance. Previous research has concluded that e-cigarette use increases the risk of using combustible cigarettes among youth. The current study pursued a causal inference strategy to examine the relationship between use of electronic cigarettes (e-cigarettes) and subsequent cigarette use. The estimand was defined as the average treatment effect among the treated, i.e. the change in risk of subsequent cigarette use had youths not used an e-cigarette, or if they had not used a cigarette. **Methods.** Data from two youth subsamples from the first three annual waves of the Population Assessment of Tobacco Use and Health study were analyzed. All participants were tobacco naïve at Wave 1. Sample 1 had heard of e-cigarettes, and had used e-cigarette exclusively or not used any other tobacco products at Wave 2 (n = 6211); Sample 2 had used combustible cigarettes exclusively or not used any other tobacco products at Wave 3 (n = 6040). To assess the association between e-cigarette and subsequent cigarette smoking, we included 56 covariates from Wave 1, e-cigarette exposure at wave 2, and cigarette use (outcome) at wave 3. We used entropy balancing to reweight tobacco use (e-cigarette use in Sample 1; cigarette use in Sample 2) and nonuse groups to balance the distribution of covariates. We conducted weighted logistic regression (with unbalanced covariates, if needed) using the product of sampling weights from Wave 3 and entropy balancing weights to adjust for nonresponse and sampling bias. **Results.** Results indicated that, among tobacco naïve youth, e-cigarette use was associated with greater risk for subsequent cigarette smoking initiation in the following year, confirming an association between initial use of e-cigarette in tobacco naïve youth and risk of cigarette ever use (adjusted OR = 2.92, 95% CI = (2.89, 2.97)) and current cigarette use (adjusted OR = 3.29, 95% CI = (3.19, 3.39)). However, the latter risk was comparatively lower than the risk caused by youth starting with a combustible cigarette (adjusted OR = 23.34, 95% CI = (22.42, 24.29)).

Conclusion. Use of e-cigarette in nicotine and tobacco-naïve youth is associated with increased risk of subsequently using cigarettes but the risk is an order of magnitude higher if they start with a cigarette.

FUNDING: Academic Institution

PS4-124

FLAVOR TYPE ASSOCIATIONS AND QUITTING BEHAVIORS IN DUAL AND ENDS-ONLY USERS

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Significance: Adult tobacco users, especially electronic nicotine delivery system (ENDS) users, report consuming flavored products to support quitting tobacco, yet the association between flavor type and quitting-related behaviors has not been extensively studied. **Methods:** An address-based sample of Ohio adults who reported cigarette and ENDS use (i.e. dual users) (N = 81) or ENDS-only use (N = 111) was studied at 6-month intervals through 36 months. Differences between user types (dual versus ENDS-only) were evaluated using chi-square tests. Differences in cessation interest by ENDS flavor (i.e. fruit/sweet, menthol/mint, tobacco/unflavored, and other/multiple) were evaluated using Kruskal-Wallis tests. For any time point, logistic regression analyses were conducted to examine the association between ENDS flavor type and quitting all products. Among dual users only, ENDS flavor type was examined related to quitting cigarettes and reduction in daily number of cigarettes smoked. **Results:** No significant differences in demographic characteristics were found between dual users and ENDS-only users. Dual users reported more attempts to quit any product in the past year, compared to ENDS-only users (55.6% vs. 31.8%; p < 0.001) and had higher mean interest in quitting all products compared to ENDS-only users (7.3±2.7 vs. 5.9±3.3; p = 0.007). Based on ENDS flavor type, no overall difference in cessation interest was found across the 4 flavor groups for all users (p = 0.116), for dual users (p = 0.405), nor for ENDS-only users (p=0.480). ENDS-only users had higher odds to quit all product use over time compared to dual users (OR = 3.43, 95% Confidence Interval = 1.61, 7.30; p = 0.001). However, no association between ENDS flavor type and quitting all products was found in either group. Among dual users, no relationship was found between ENDS flavor type and quitting cigarettes or reducing consumption. **Conclusions:** Preliminary findings suggest that ENDS flavor type was not related to any quitting-related behaviors among adult dual and ENDS-only users. These data may help in determining possible flavored ENDS regulation when it comes to cessation options for adults.

FUNDING: Federal

PS4-125

E-CIGARETTE ADVERTISING AND HOUSEHOLD USE ARE ASSOCIATED WITH E-CIGARETTE USE INTENTIONS AMONG LOW-RISK YOUTH: RESULTS FROM THE NATIONAL YOUTH TOBACCO SURVEY (NYTS) 2014-2018

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Significance: E-cigarette use maybe appealing to low-risk youth but studies evaluating reasons for e-cigarette appeal among this group are lacking. **Methods:** We examined e-cigarette use intentions among youth (6-12 grades) in the United States, who reported never using any tobacco product including e-cigarettes. We used five waves from the National Youth Tobacco Survey (2014-2018). Odds ratios were estimated to examine correlates of an E-Cigarette Use Intention (ECUI) composite measure using multivariate logistic regression analyses of weighted data. ECUI measure was defined as lacking a firm commitment to not using e-cigarettes, either "soon" or "if offered by a friend". Those who responded "definitely not" to both intentions questions were classified as not having ECUI; otherwise, respondents were classified as having ECUI. Survey year, gender, school type (middle or high school), and race-ethnicity were included as covariates in all models. **Results:** Females comprised 51.7%, and 55% were in middle-school. Of the 59,004 youth who reported never trying any tobacco product including e-cigarettes, 24.4%



reported having **ECUI**. In adjusted analyses, compared to youth with no **ECUI**, youth having **ECUI** were more likely to report seeing internet and retail ads (aOR=1.33, 95% CI=1.27, 1.39, p<0.001; aOR=1.12, 95% CI=1.06, 1.19, p<0.001 respectively). In a separate model accounting for number of ad channels, youth exposed to 1-2 or 3-4 ad types (vs. none), were more likely to have **ECUI** (aOR=1.42, 95% CI=1.37, 1.48, p<0.001; aOR=1.47, 95% CI=1.40, 1.53, p<0.001 respectively). Compared to youth with no household member using any form of tobacco, youth living with e-cigarette or other tobacco users were more likely to have **ECUI** (aOR=2.38, 95% CI=2.27, 2.49, p<0.001; aOR=1.39, 95% CI=1.34, 1.45, p<0.001 respectively). **Conclusion:** One quarter of never tobacco users has **ECUI**. The type of ad channel and intensity of exposure to e-cigarette ads are salient predictors for **ECUI**, which is reminiscent of the impact of combustible cigarette advertising on youth. In order to protect youth from tobacco use, the broadcast ban on cigarettes should be extended to include e-cigarettes. The exposure to other e-cigarette users at home may relate to the normalization of e-cigarette use at home or impact of role models on youth behavior. Advocating for e-cigarette free homes may have an additional benefit of preventing youth e-cigarette initiation.

FUNDING: Federal

PS4-126

WHAT CREATES INTEREST ON HEATED TOBACCO PRODUCTS (HTP'S) IN A COUNTRY WITH NO LEGAL PRESENCE

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Background: In many countries, the tobacco industry has been promoting new Heated Tobacco Products (HTP's) as "reduced risk products" that are rapidly increasing market share. In Mexico, HTPs are illegal but can be purchased, and industry is lobbying to introduce HTPs legally. This study evaluated the prevalence and correlates of Mexican smokers' awareness of HTP's and their interest in trying them. **Methods:** We analyzed data from an online survey of Mexican adult smokers who were recruited from a marketing research panel (n=3,057, including 1,023 dual users of cigarettes and e-cigarettes). Participants were provided with a brief description and image of HTPs, after which they were asked about their awareness of HTPs and their interest in trying them. Adjusted logistic models regressed each of these outcomes on sociodemographic characteristics; frequency of cigarette consumption; preference for flavor capsule cigarette brands; recent attempts to quit; intention to quit; smoking and vaping among friends and family; online exposure to tobacco ads; and last month e-cigarette use, binge drinking, and marijuana use. **Results:** Approximately 17% of smokers had heard about HTPs. We found that higher education; being dual user (cigarette and vaping); having previous quit attempts; friends or family members who vape; and being exposed to online or email ads are related with knowledge of HTPs. About 74% of the sample were interested in trying HTPs. Independent correlates of interest included: being middle age; greater frequency of smoking; being interested in quitting; being exposed to online ads; having friends who vape; last month vaping and binge drinking. **Conclusion:** Research is needed to assess if the impact found in this study regarding awareness and willingness to try correlates in non-smoking population. This will inform the decision making about the regulation of internet campaigns. This study was supported by of the Fogarty International Center of the National Institutes of Health under award number R01 TW010652. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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PS4-127

EFFECTS OF DEPRESSION AND SELF-EFFICACY ON SMOKING CESSATION

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Significance: While impressive declines in cigarette smoking rates have taken place over recent decades, smoking prevalence remains high in certain subpopulations. One such group is individuals with mental illness. One explanation for the low cessation success rates is low self-efficacy to quit. In the current study, we utilized longitudinal data to test whether self-efficacy to quit smoking mediated the relationship between level of depression and smoking cessation. **Methods:** Participants were from a longitudinal study

of smoking attitudes and behaviors who reported daily cigarette smoking in 2005 and reported their smoking status in 2011 (n=905). Multiple regression was used to test depression and self-efficacy as prospective predictors of smoking cessation after controlling for sex, educational attainment, and nicotine dependence. **Results:** First, depression and self-efficacy were not significantly related to each other, so there was no evidence of mediation. Second, depression (p=.052) and self-efficacy (p=.002) prospectively predicted quitting in 2011, but these effects became non-significant when sex, educational attainment, and nicotine dependence were added to the model. Third, because the null effects of depression and self-efficacy on the quitting outcome variable may be due to the six-year time gap, we tested the effects of the same predictors on intention to quit smoking measured in 2005. In this cross-sectional model, depression (p=.045) and self-efficacy (p<.001) were significantly associated with intention to quit, even after controlling for sex, educational attainment, and nicotine dependence. Fourth, in terms of moderation, self-efficacy was more strongly associated with intention for non-depressed participants than for depressed participants. **Conclusions:** We found no evidence that self-efficacy mediated the relationship between depression and smoking cessation in a longitudinal model, and the unique effects of depression and cessation were wiped out when sex, educational attainment, and nicotine dependence were included in the model. However, our findings did suggest that both depression and self-efficacy might play a role in the quitting process by influencing more immediate intentions to quit.

FUNDING: Federal

PS4-128

COLLEGE STUDENT PAIRED USE OF SOCIAL MEDIA AND JUUL

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Introduction: JUUL leads U.S. e-cigarette sales with a 76% market share in 2018. JUUL use is high among college students, with as many as 21% reporting past 30-day use. Some of JUUL's success can be credited to its social media presence. The purpose of this study was to examine how college students communicate about JUUL on social media. **Methods:** This sequential explanatory mixed-methods design employed a sample of college students from a large university. Current JUUL users (n=667) completed a cross-sectional survey in March 2019, with 51 survey participants taking part in follow up interviews in April 2019. Survey questions asked history of posting and commenting about JUUL on social media. Interview questions asked participants for reasons why they did/did not post or comment about JUUL on social media. Qualitative data was coded independently by two coders using NVivo and analyzed for themes. Inter-coder reliability was 98.65% agreement. **Results:** Survey participants (n=667, ages 18-24, mean age 20) were 50.5% female and 80.6% white. While survey responses showed 81% had not posted a JUUL-focused comment on social media and had not posted a picture of themselves JUULing in the past year, interview data revealed greater than expected use of JUUL on social media. Most (41/51) interview participants stated they had never posted JUUL-related pictures or comments featuring themselves on social media because it could harm their image to family or potential employers. However, 31% of participants were comfortable sharing JUUL-related personal photos on private Instagram accounts (Finstas) or Snapchat due to the platforms' hidden or temporary nature. About half (43%) of interview participants had shared humorous JUUL-related comments and images (memes) on social media, which they did not consider to harm their image. Many did not consider memes as sharing or posting in the survey questions. **Conclusion:** How social media questions are asked is critical for accurate measurement of college student promotion of JUULing and social norms. Including Snapchat, Finstas, and meme use in research is needed to accurately measure college student promotion of JUUL on social media.

FUNDING: State; Academic Institution

PS4-129

ALEXITHYmia IMPAIRS EMOTION REGULATION PROCESSES AND INCREASES SMOKING AMONG PREGNANT WOMEN

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Smoking during pregnancy has not declined for low socioeconomic status (SES) women at the same rate as it has for high SES women (Griffiths et al., 2016). Consequently, developing effective smoking cessation interventions for low SES pregnant women remains a public health priority. Whereas non-pregnant smokers can access NRT and cessation medications, there is no clear consensus on use by pregnant women; additionally, many women are reluctant to use them or are noncompliant (Bittoun & Femia, 2010). Behavioral interventions for smoking cessation remain the most accepted strategy



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for smoking cessation among pregnant smokers but are only effective for a subset of individuals with much room for improvement in quit rates. Understanding factors that reduce the effectiveness of behavioral interventions is needed. Alexithymia (Sifneos, 1973) may interfere with behavioral smoking cessation interventions by restricting access to emotional information and increasing maladaptive behaviors (Lyvers, Brown, & Thorberg, 2018). Understanding the role of alexithymia in disrupting emotion regulation processes may help to adapt and improve existing behavioral therapies. Pregnant smokers ($n=73$) completed measures of smoking, alexithymia, nicotine dependence, and difficulties with emotion regulation at baseline and after 8 sessions of cognitive-behavioral smoking cessation treatment. A longitudinal path model evaluated the hypothesis that pretreatment alexithymia would have an indirect effect on end-of-treatment smoking through emotion regulation. The model fit the data well. Alexithymia predicted difficulties with emotion regulation ($\beta=.62$; standard error=.007; $p<.000$). The bootstrapped standardized indirect effect of alexithymia on smoking was significant ($\beta=.12$; 95 percent confidence interval: .01-.24). Findings indicate that alexithymia disrupts emotion regulation processes, which may motivate and result in greater smoking, thus contributing to reduced effectiveness of cognitive-behavioral smoking cessation interventions for some pregnant women. Intervention supplements that address alexithymia (e.g., identifying and differentiating emotions) may help improve quit rates.

FUNDING: Federal; Other

PS4-130

EFFECTS OF TOBACCO PRODUCT TYPE AND CHARACTERISTICS ON APPEAL AND PERCEIVED HARM: RESULTS FROM A DISCRETE CHOICE EXPERIMENT AMONG GUATEMALAN ADOLESCENTS

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Significance: Guatemala is one of only a few countries where sale of both heated tobacco products (HTPs) and electronic cigarettes (ecigs) are allowed. This study used a discrete choice experiment (DCE) to assess how tobacco product attributes influence their appeal among Guatemalan youth. **Methods:** A DCE was administered to 2265 students between 13 to 17 years old. Experimental manipulations included: product type (cigarette, HTP, ecig); brand (2 per product type); nicotine content (none, 12mg); and flavor (tobacco, menthol, cherry, berry). An alternative specific block design was used whereby participants were randomly assigned to evaluate 4 of 32 contrasting sets, each containing 3 packs for a different product type. For each choice set, participants indicated which product they were most and least interested in trying and which would be most and least harmful to their health. Each choice set also had a "no difference" option. Only those participants who selected at least one pack across sets were analyzed ($n=1879$ for interest; $n=2161$ for harm). Conditional logistic regression models using effects coding were used to assess the impact of product characteristics on choice. **Results:** Product type accounted for almost 90% of variation in choices. Respondents were least interested in trying HTPs ($B=-1.18$; $p<0.001$) and viewed them as most harmful ($B=1.14$; $p<0.001$). They were most interested in trying ecigs ($B=0.85$; $p<0.001$), which were also perceived as least harmful ($B=-0.85$; $p<0.001$). Products with nicotine were of less interest for trying ($B=-0.04$; $p=0.005$) and perceived as less harmful ($B=-0.05$; $p=0.002$) than those without nicotine. Students were least interested in trying tobacco flavored products ($B=-0.08$; $p=0.004$) and most interested in trying berry flavored products ($B=0.06$; $p=0.020$). **Conclusion:** According to our findings, in this country with weak tobacco control and no ecigs and HTP regulation, ecigs appear to be more appealing and perceived as less harmful compared to HTP and cigarettes. Regulations are urgently needed on these products packaging as well as in flavorings as they are a marketing strategy to reach adolescents.

FUNDING: Federal

PS4-131

CONTINUING TO IMPROVE SUSTAINABILITY CAPACITY FOR STATE TOBACCO CONTROL PROGRAMS THROUGH TECHNICAL ASSISTANCE: A CONTINUOUS, HANDS-ON, AND ADAPTABLE APPROACH

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In order to achieve the full benefit of significant investment in public health research and program development, it is imperative to understand the factors related

to sustainability and develop tools and trainings that support strategic, long-term sustainability. However, no evidence-based program sustainability training and technical assistance (TA) curriculum currently exists. This study seeks to develop, deliver, evaluate, and disseminate a sustainability training and TA curriculum that progresses the institutionalization of evidence-based tobacco control (TC) programs. This multi-phase randomized control trial aims to evaluate sustainability capacity through training workshops and TA among evidence-based tobacco control programs. To date, 24 states (12 intervention and 12 comparison) have been enrolled in the study. The study team has completed workshops and initial TA with eight intervention states. The two-day, in-person workshops consist of hands-on, active learning discussions and activities to facilitate sustainability action planning. Day 1 includes discussion about defining the tobacco control program and discusses the Program Sustainability Framework and Program Sustainability Assessment Tool (PSAT) results. Day 2 includes building upon the first day's discussion to create a SMART objective within a well-established sustainability action planning template. Following the training, intervention states are provided with two years of TA. The TA approach includes a "menu" of interactive support offerings for each state, including: quarterly troubleshooting calls, group webinars, email newsletters, capacity-building activities and worksheets, and online resources. The approach is consistent, yet tailored to the needs of each state, to ensure the desires and capacities of each state are adequately addressed. The study team encourages stakeholders from various levels of the program to be included in TA activities. This approach has increased buy-in and improved accountability for implementing the sustainability action plans. The purpose of this abstract is to share what our research team has learned as the most effective training and TA methods. The study is currently underway. The workshop and TA approaches are continuously being evaluated throughout the course of the project to inform final dissemination materials. All data will be analyzed by 2021, and formalized findings will be ready to present by 2022.

FUNDING: Federal

PS4-132

SMOKING, SOCIAL TRUST AND POLITICAL PARTICIPATION—A NATIONAL SURVEY EXAMINING THE RELATIONSHIP BETWEEN SMOKING AND REGISTERING TO VOTE

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Significance: Smoking has long been recognized as one of the largest causes of a variety of health risks, illness, and death. However, the impacts of smoking behaviors on socio-political outcomes, especially political participation, are largely under-investigated. This research investigates the association between smoking and registering to vote through a national survey conducted in the 2012 presidential election, and further explores the underlying mechanisms—whether social trust helps explain this relationship. **Methods:** A total of 9,750 adults (aged 18+ years), including 2,857 from outside Colorado and 6,893 from Colorado responded to The Attitudes and Behaviors Survey on Health (TABS) with an additional section on registering to vote and trust. Multivariable logistic regression was used to examine the association between smoking and registering to vote controlling for other covariates known to be associated with both variables. Analyses used design-based methods with weights to account for sampling probabilities, nonresponse, and calibration of the sample to the U.S. adult population in 2012. **Results:** Registering to vote was negatively associated with smoking behavior, adjusted for age, marital status, ethnicity, education level, income level, perceived health status, and health insurance status. Daily smokers had significantly lower adjusted odds of registering to vote (aOR: 0.31, 95% CI: 0.20-0.48) and higher adjusted odds of having low trust in people (aOR: 2.50, 95% CI: 1.29-4.83) than nonsmokers. Low trust in people reduced the odds of registering to vote (aOR: 0.55, 95% CI: 0.36 to 0.84). Low interpersonal trust partially mediates the effects of smoking status on not registering to vote. Analyses of open-ended questions showed the reasons for not registering to vote differed between daily smokers and nonsmokers. For nonsmokers, the top reason was "not citizens" (25.9%). For daily smokers, the main reasons included "don't care" (30.8%) and "no time" (19.5%). **Conclusions:** Being daily smokers were significantly associated with lower odds of registering to vote. Low trust in people partially explains the negative association between smoking status and registering to vote.

FUNDING: State



PS4-133

EXPLORING THE FEASIBILITY AND UTILITY OF COTININE BIOMARKERS TO ADDRESS UNDERREPORTING OF TOBACCO USE - A PILOT STUDY IN THREE CITIES IN AFRICA

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Significance: Tobacco surveillance traditionally relies on self-reported data, which has proven to be reliable in high-income countries. As the tobacco epidemic shifts to lower- and middle-income countries, the validity of self-report must be reevaluated, particularly among women in countries with low social acceptability of tobacco use. **Objective:** To assess the utility and feasibility of including cotinine biomarkers in representative household surveys in three capital cities in Africa. **Methods:** We conducted household surveys that included a biomarker component among young adults ages 13-29 in Lusaka, Accra, and Nairobi between May 2017 and June 2018. We used the NicAlert biomarker, a semi-quantitative saliva-based rapid test. We calculated the sensitivity, specificity, positive-predictive value, and negative-predictive value of self-report compared to the biomarker results among 6,548 respondents, and utilized logistic regression to identify predictors of underreporting. **Results:** Across all three locations, we find evidence of underreporting of tobacco use, when comparing self-report to biomarker data. The sensitivity of self-report was 61% (57-65%) among men and 24% (19-29%) among women. Logistic regression reveals that individuals who are younger, female, or do not have a close friend that smokes are more likely to underreport their tobacco use. The positive-predictive value of self-report was also low: 46% (42-50%) among men and 26% (21-32%) among women. Occasional tobacco use and use of non-cigarette products may explain the low positive-predictive value. The specificity and negative-predictive value of self-report both exceeded 85% among men and women. **Conclusion:** We find significant underreporting of tobacco use among teenagers and young adults in Lusaka, Accra, and Nairobi. Future inclusion of cotinine biomarkers in representative surveys will allow for adjustment of self-report bias in prevalence estimates, and is of particular importance for tobacco control in countries with low social acceptability of tobacco use among women.

FUNDING: Nonprofit grant funding entity

PS4-135

COMMUNITY DENSITY OF TOBACCO VENDORS AND PSYCHOSOCIAL RISK OF TOBACCO USE DURING EARLY ADOLESCENCE IN INDIA

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Background: Observational studies suggest that fewer tobacco vendors in community settings is associated with lower risk of tobacco use in youth. We examined the association between community density of tobacco vendors in India and psychosocial risk factors for tobacco use during early adolescence, a sensitive period for tobacco use initiation. **Methods:** In 2018-2019, a random sample of 1982 households with a 12-14 year old adolescent present was surveyed from 52 communities in Mumbai and Kolkata. Field GIS (Geographic Information Systems) data were collected about the location of all tobacco vendors in each community. Random-effects multilevel logistic regression was used to estimate associations between tobacco vendor density (number of vendors per community in tertiles) and psychosocial risk factors for adolescent tobacco use initiation (intention to use tobacco, perceived ease of access to tobacco and perceived peer tobacco use), while controlling for socio-demographic factors (age, gender, religion, household head educational attainment, community population size and city) and accounting for cluster sampling. We then stratified the analysis by gender. **Results:** There were 5041 tobacco vendors across the 52 communities (range: 14-374; mean: 97; median: 83). There were more tobacco vendors on average per community in Mumbai than Kolkata (105 vs. 90, $p < 0.001$). Community tobacco vendor density was not associated with intention to use tobacco and perceived peer tobacco use, but was positively associated with perceived ease of access to tobacco products in the full sample ($p = 0.0207$), and in males ($p = 0.0001$), but not females ($p = 0.0938$). **Conclusions:** There was an extremely high density of tobacco vendors in community settings in Mumbai and Kolkata. Tobacco vendor density appears to increase perceived ease of access to tobacco products in young adolescents, particularly in males, which may increase their risk of tobacco use initiation. Efforts to reduce the number of tobacco vendors in communities in India may reduce perceived access to tobacco products in youth.

FUNDING: Federal

PS4-136

PERCEPTIONS AND BEHAVIORS OF PREGNANT DUAL SMOKERS

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Significance: The use of conventional cigarettes during pregnancy has been linked with adverse perinatal outcomes, yet far less is known about electronic cigarette (e-cig) use. Mixed media messages and lack of scientific evidence has led to uncertainty regarding the health effects of e-cig use. Often, pregnant users initiate e-cig use as an aid for smoking cessation, however emerging evidence suggests e-cig users are often dual-users (conventional plus e-cig), potentially compounding deleterious health effects. The purpose of this study, comprised exclusively of pregnant smokers, was to describe the perceptions of e-cig use and smoking-related behaviors of pregnant dual users. **Methods:** A preliminary analysis was conducted on cross-sectional, enrollment data from a larger study of pregnant conventional (conv)-only and dual users, with validated tobacco use. Participants, aged 18-44, completed a brief survey including questions measuring perceptions of e-cig use in pregnancy, smoking behaviors, and dependence (Penn State Cigarette Dependence Index [PSCDI]). Descriptive statistics and regression analysis were completed using SAS version 9.4 (alpha of .05). **Results:** Among the 176 eligible pregnant women, 100% were current conv cigarette smokers and 38% were also current e-cig users (dual users). More than half of participants believed e-cigs were harmful to women (56%), posed harm to the fetus (53%), and caused lung disease (49%). More than one-third (39%) of the sampled reported e-cig use to be acceptable for pregnant women. Among dual users, 41% used their e-cig daily, on average 8 times/day. The most common e-cig liquid flavor reported was fruit (64%), followed by mint/menthol (35%), and the most frequently-reported range of e-cig nicotine concentration was 1mg-6mg. More dual users (11%) than conv-only users (3%) reported smoking greater than a pack of cigarettes per day, and dual users scored significantly higher on the PSCDI scale. **Conclusion:** The health effects of e-cig use continue to remain largely unknown which may impact perceptions and use behaviors. As there is no safe level of smoking during pregnancy, health professionals should counsel pregnant women to cessation.

FUNDING: Federal

PS4-137

MAPPING TOBACCO STORIES -- INTEGRATING WEB-BASED MAPPING WITH QUALITATIVE INTERVIEWS TO UNDERSTAND TOBACCO DISPARITIES ACROSS NEIGHBORHOODS

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SIGNIFICANCE: Neighborhood-level disparities in tobacco use are important drivers of health inequity. Innovative methods can highlight people-place interactions that reproduce tobacco disparities within local geographies, and elicit community perspectives on tobacco policies. This multi-method pilot study in the San Francisco Bay Area elicited perspectives of smokers from different Bay Area neighborhoods on tobacco practices and norms, identifying factors that could affect implementation and impacts of new tobacco policies (e.g., menthol/flavored tobacco sales ban). **METHODS:** Participants (n=8) were adult current tobacco users recruited from Bay Area zip codes with: 1) high menthol use; 2) high use of any tobacco; or 3) low/average use of tobacco. Participants gave in-depth, semi-structured interviews using Streetwyze, an online mapping platform, to drop pins, and noted neighborhood places where they smoked or observed tobacco, and areas where they did not smoke or that they considered 'anti-tobacco'. **RESULTS:** The interactive mapping interview method grounded discussion in everyday places impacting tobacco use. We observed between and within neighborhood similarities and differences in how residents: (1) Practice smoking to enhance sense of wellbeing (e.g., meditative, relaxing practice at the bus stop or while driving); (2) Negotiate (in) formal spatial regulation of smoking (e.g., strangers' (dis)approval of smoking); (3) Enact 'considerate smoker' identities (e.g., not smoking around children/sick/older people or in business doorways; picking up cigarette butts); (4) Relate to the social contexts of tobacco retail outlets (e.g., the local smoke shop as a place to connect socially, avoid for safety concerns, or do business); and, (5) View tobacco policies (e.g., flavored tobacco sales bans as part of gentrification; public smoking bans as unfair to unhoused people; preference for banning tobacco sales). **CONCLUSION:** In-depth interviews



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with interactive mapping can provide a participant-centered approach to understanding people-place relationships that perpetuate neighborhood tobacco disparities and affect local tobacco policy implementation.

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PS4-138

BASELINE ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PERCEPTION OF SMOKERS AND NON-SMOKERS IN NIGERIA REGARDING TOBACCO HARM REDUCTION STRATEGIES.

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Introduction: Having known the scientific consensus that tobacco cigarettes are the most deadly form of nicotine consumption, tobacco smokers have a right to clearly understand this and make informed decisions on available tobacco harm reduction strategies available. The purpose of our study was to assess the knowledge, attitude and perception of smokers and nonsmokers in Nigeria regarding tobacco harm reduction strategies.

Method: This study was a cross-sectional survey of smokers and non-smokers in Nigeria. We collected data on their knowledge, attitude and perception regarding tobacco harm reduction strategies including their demographic characteristics. For the nonsmokers, the study tool was a validated web-based questionnaire. Data obtained were analyzed using descriptive statistics. While for the smokers, semi-questionnaire interview was carried out. Data were analyzed, extracted and summarized.

Result: A total of 30 current smokers and 80 non-smokers participated in the study. 80% (n=64) of the non-smokers and 90.1% (n=27) of the smokers perceived tobacco harm reduction products to be excellent. 90% (n=72) of the non-smokers perceived that tobacco harm reduction should be made available while 70% (n=21) of the smokers would prefer to use alternative nicotine products but availability is a challenge. 100% of both the smokers and the non-smokers believed that public enlightenment on tobacco harm reduction in the country is poor. Only 20% (n=6) of the smokers and 30% (n=24) of the non-smokers knew that electronic cigarette is legal in Nigeria. 98% (n=79) of the non-smokers believed tobacco harm reduction strategies will reduce the risk that secondhand smokers are exposed to.

Conclusion: The attitude of both smokers and non-smokers to tobacco harm reduction can be described to be positive among people that are aware of tobacco harm reduction strategies. The awareness and knowledge level regarding tobacco harm reduction is low in Nigeria. We suggest further studies to cover more smokers and non-smokers which will ensure effective policy making in the country. We recommend that governments should achieve their responsibilities by creating policy, regulation and legislation that enables smokers to have access to information and services about products that can reduce the harm caused from smoking.

FUNDING: Unfunded

PS4-139

PATTERNS OF CAUSES OF DEATH ATTRIBUTABLE TO TOBACCO IN DIFFERENT PARTS OF THE WORLD.

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Introduction. The burden of disease attributable to tobacco varies widely between different causes of death and between regions/countries. The purpose of this study is to ascertain some key characteristics of these patterns. **Methods.** Primary data have been retrieved from the Global Burden of Disease Study 2017, GBD 2017, database by using the *GBD Compare Tool* from The Institute for Health Metrics and Evaluation. These data have been used to describe patterns of mortality attributable to tobacco.

Findings: Globally, 20% of all deaths in males and 8% in females are estimated to be attributable to tobacco. Higher proportions in males are found in, for example, Eastern Europe (30%) and East Asia (33%), lower proportions in, for example Australia (15%) and Sub-Saharan Africa (5%). The vast majority of these cases are deaths from cancer, CVD and COPD. Globally, CVD is the largest category (61 deaths per 100,000 among males, 19 among females), while in Western Europe cancer is the largest category (103 deaths per 100,000 among males, 43 among females). Comparisons between various countries with respect to rates for tobacco-related deaths from different diseases do clearly reflect national differences in tobacco use patterns. One example is the comparison between the Western Europe countries with respect to male tobacco-related deaths in cancer of: Lip and oral cavity, Nasopharynx, Larynx, Stomach and Pancreas. All of these diseases have been suspected to be caused not only by smoking but also by Swedish snus. However, in each one of those comparisons, the country where snus is the dominating kind of tobacco use (Sweden) is found to have the lowest or next lowest death rate in Western Europe. **Conclusions:** There are inter-country and inter-gender differences in tobacco-related mortality both in terms of size of effects and proportion of deaths from

different diseases. These differences are not only associated with overall prevalence of tobacco use but also with the proportion of different tobacco products that are used. For example, there are inter-country comparisons that support the emerging evidence that health risks of Swedish snus are extraordinarily small.

FUNDING: Unfunded

PS4-140

ADOLESCENTS' AND YOUNG ADULTS' REASONS FOR USING JUUL

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BACKGROUND. Juul commands more than 70% of the market for vaping products and has contributed to an epidemic of vaping nicotine among US youth. We sought to examine adolescents' and young adults' use and perceptions of Juul, including use motives that could inform Juul and other pod mod regulation as well as prevention programs. **METHODS.** An online survey from January to March, 2019, was completed by 3075 CA residents who were recruited on social media (n=1520 youth 15-17 years; 1038 young adults 18-20 years; and 1520 adults 21-29 years). The sample included 7.7% Hispanic and Non-Hispanic (NH) African American (AA), 28.1% Hispanic (Non-AA), 28.7% NH-Asian, 27.5% NH-white, 5.7% NH-other/multiracial, and 23.6% LGBTQ respondents. Outcome measures assessed Juul use, motives, knowledge and perceptions. **RESULTS.** Almost 1 in 3 respondents (30.5%) had ever used Juul, with most ever-users using it 1-2 days in the past 30 days; 40.1% used mint or menthol and 67.7% used fruit, mango, crème or cucumber. Ever-users obtained Juul in the past 30 days from friends (54.5%), at a vape or smoke shop (39.8%), or 15.2% online. Other than use by peers, the main reasons for using Juul were perceptions that: they come in flavors that taste good (42.9%), are less harmful than smoking cigarettes (31.2%), and easy to use without someone noticing (30.0%). Only 14.0% of Juul ever users were using Juul to quit smoking. Reasons for not using Juul were perceptions that the product is harmful to their health (71.0%), contains nicotine (62.7%), is addictive (58.8%), having seen advertisements about harms (34.4%), and friends did not use (26.6%). In multivariable analyses, results varied by ever/current use, parent education, age group, and sexual identity (LGBTQ), but not by gender identification and race/ethnicity. **CONCLUSIONS.** Although Juul voluntarily pulled flavored products from more than 90,000 stores in August 2019, menthol flavor and stealth vaping still appeal to youth/young adults. This priority population would benefit from policies to regulate flavors and limit product retail access, and from targeted prevention messages that discuss Juul nicotine content, harm, and addictiveness.

FUNDING: State

PS4-141

IS TIME TO FIRST CIGARETTE SHORTER AMONG CIGARETTE SMOKERS WHO USE CANNABIS COMPARED WITH THOSE WHO DO NOT. ROLE OF CIGARETTES PER DAY AND FREQUENCY OF CANNABIS USE.

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Significance: Cigarette and cannabis use are closely linked and the use of cannabis is increasing over time in the United States (US) and other countries. The aim of the current study was to determine whether a shorter time to first cigarette in the morning (TTFC), an indicator of nicotine dependence, is more common among cigarette smokers who use cannabis compared with those who do not and to examine whether this association varies by frequency of cigarette use and cannabis use. **Methods:** Data were drawn from the 2002-2017 National Survey on Drug Use and Health (NSDUH), an annual, cross-sectional sample of persons ages 12 and older representative of the US. The prevalence of shorter time to first cigarette on awakening (<30 minutes) by cannabis use status (past-3 month) among past-month cigarette smokers were estimated. Results were stratified by number of cigarettes smoked per day (CPD) and number of days of cannabis use per month (any use, non-daily and daily use). **Results:** Overall, cigarette smokers with daily cannabis use were significantly more likely to have shorter TTFC (<30 minutes) than smokers who did not use cannabis in the past month (56.4% vs. 47.1%; adjusted Odds Ratio (aOR)=1.6 (1.3, 2.1)). Among heavy smokers (16+ CPD), both non-daily (86.0% vs. 77.5%; aOR=1.7 (1.1, 2.6)) and daily cannabis



use (88.0% vs. 77.5%; $aOR=2.2$ (1.4, 3.5)) were significantly more likely to report TTFC <30 minutes, compared with heavy smokers who reported no past-month cannabis use. **Conclusions:** Time to first cigarette sooner than 30 minutes, a marker of nicotine dependence, is significantly more common among cigarette smokers who use cannabis—especially daily cannabis use—compared with those without cannabis use. This relationship is strongest among heavy cigarette smokers. Within the rapidly changing landscape of substance use in the US, co-use of cannabis and tobacco requires increased attention in public policy, tobacco control and smoking cessation.

FUNDING: Federal

PS4-142

TRUCK DRIVERS AND CIGARETTE SMOKING A PILOT STUDY

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Introduction Some studies show that truck drivers use tobacco and other stimulants to stay awake as they drive. Cigarette smoking is associated with disturbances in sleep, and is the leading cause of preventable death and morbidity. Despite their increased risks for many of tobacco-related health disparities, there is limited engagement of truck drivers in smoking cessation programs. The objective of this study was to describe smoking characteristics and smoking cessation methods among truck drivers. **Methods** This was a cross-sectional mixed methods study. Participants were truck drivers recruited at trucking companies in Utah in 2019. Participants were either individually interviewed ($n=4$), or filled out a survey questionnaire ($n=33$). Qualitative data analysis were followed by descriptive statistics of smoking and cessation characteristics. **Results** Participants in qualitative interviews reported reasons for smoking to include, staying awake, calming, or stress reduction feeling after smoking, and something to do while driving other than eating. Of the 33 truck drivers surveyed, 82% were males, and all surveyed had a mean age of 39.6 (range 24 to 61) years old. Of the surveyed, 68.8% were daily smokers, and 97% had smoked at least 100 cigarettes in their life time. Among the surveyed who smoked 10 or more cigarettes per day (cpd), $n=22$, the average was 22 cpd. 61% of the surveyed had made at least a quit attempt. 21% of the surveyed would like to receive cell phone messaging at least 3 times a week to help them quit. 18% prefer a one-time 10-15 minutes brief advice, and 15% prefer a 20-30 minutes phone counselling at least every two weeks as support to quit. In addition to counseling or brief advice, 42% of the surveyed prefer to use nicotine gum, and 24% the nicotine patch to help them quit. **Conclusion** A meaningful proportion (68.8%) of truck drivers surveyed were daily smokers suggesting that cigarette smoking is a public health problem among truck drivers. Additionally, findings of 61% of the surveyed having made a smoking quit attempt is an indication that truck drivers want to quit, and interventions tailored to their needs might assist them quit.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PS4-143

PREDICTORS OF QUITTING AMONG CIGARETTE, WATERPIPE, AND DUAL MALE SMOKERS IN RURAL VIETNAM

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Significance: Waterpipe and cigarette smoking are prevalent in Vietnam, particularly among men. Bamboo-waterpipe is the main waterpipe used in rural areas. We investigated baseline predictors of smoking cessation among males in rural Vietnam receiving a Village Health Worker (VHW) delivered smoking cessation intervention. **Methods:** A baseline survey was conducted with 1151 adult male smokers whom all received the VHW intervention. We used multivariate logistic regression analyses to identify predictors of smoking cessation among exclusive cigarette, exclusive waterpipe, and dual smokers. The primary outcome was smoking cessation, defined as carbon monoxide (CO) confirmed 7-day point prevalence abstinence at 6-month follow-up. **Results:** Our sample included 47% exclusive cigarettes, 34% dual users and 19% exclusive waterpipe smokers. Dual smokers ($M=26.8$, $SD=13.5$, $p<.001$) reported higher number of smoking times per day than exclusive cigarette ($M=15.0$, $SD=8.7$) or exclusive waterpipe smokers ($M=14.6$, $SD=9.5$). Compared to exclusive cigarette smokers, both exclusive waterpipe and dual smokers were less likely to quit ($aOR=0.43$, 95% $CI=0.28, 0.65$, $p<.001$; $aOR=0.47$, 95% $CI=0.26, 0.82$, $p=0.008$ respectively). Other factors including older age ($aOR=1.65$, 95% $CI=1.29, 2.14$, $p<.001$ for a 1 IQR increase in age (19 years)) and higher confidence to quit ($aOR=1.98$, 95% $CI=1.36$,

2.94, $p<.001$ for a 1 IQR increase in confidence (3 points on the 10-point scale)) were associated with higher odds of quitting. Daily smokers (vs. non-daily) were less likely to quit ($aOR=0.60$, 95% $CI=0.39, 0.92$, $p=0.018$). Level of education, depression, hazardous drinking, time to first smoking episode, having had a recent quit attempt, frequency of tobacco use per day, and perception of health status were not associated with quit success at 6-months follow up. **Conclusion:** VHW counseling may have been more effective among exclusive cigarette smokers because of greater level of addiction among exclusive waterpipe and dual smokers and because the intervention was primarily adapted and tailored for cigarette smokers. Further adaptation is needed to improve quit rates in waterpipe and dual smokers.

FUNDING: Federal

PS4-144

TOBACCO AND NICOTINE PRODUCTS USE AND DUAL USE IN SOUTH AFRICA - RESULTS FROM THE SOUTH AFRICAN SOCIAL ATTITUDE SURVEY 2007 TO 2018

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Significance: Tobacco use is implicated in the death of more than 7 million people annually around the world mostly in low and middle-income countries. The use of more than one tobacco product can increase the risk of tobacco related diseases. This study investigates trends in the prevalence of 4 types of tobacco/nicotine products and dual products use by persons aged 16yrs and above in South Africa over a 12year period using the South African Social Attitude Survey (SASAS). **Methods:** Data from five waves (2007, 2010 2011, 2017, and 2018) of SASAS ($N=14,582$) were analyzed using SPSS version 25. Tobacco products were categorized as combustible tobacco products (CTP; manufactured cigarettes, roll your own, cigars and pipes), smokeless tobacco (SLT; nasal and oral snuff), hookah, and electronic cigarettes (e-cigs). Data were not collected for hookah and e-cigs in 2007. Current users were those who reported daily and non-daily use of each tobacco or nicotine product. Dual use (CTP and any other product) was also explored. Chi square analyses and frequencies were used to explore trends in prevalence over the 12year period. All Analyses (other than frequencies) accounted for the complex survey design and yielded nationally representative estimates. **Results:** Participants comprised 51.1% ($n=8771$) females; 77.5% ($n=9072$) Black Africans; 56.2% ($n=6538$) have never been married and more than half aged 16-34 yrs ($n=6042$). The prevalence of CTP use decreased from 21.0% in 2007 to 18.0% in 2010 but increased consistently afterwards from 19.6% in 2011 to 22.3% in 2018 while SLT use decreased from 5.0% in 2007 to 2.2% in 2011 but slightly increased from 3.9% in 2017 to 4.1% in 2018. There was a 240% increase in hookah use during the 12yr period while E-cigs use experienced a slight initial decrease from 0.5% (2010) to 0.3% (2011) but almost 70% increase between 2017 and 2018. Overall, any tobacco product (ATP) use initially decline from 25.5% (2007) to 20.2% (2010) but consistently increased afterwards to 25.9% in 2018. Dual use of tobacco products was generally low but increased from an initial 0.5% in 2007 to 1.6% in 2018 (CTP and SLT); 1.0% in 2010 to 2.8% in 2018 (CTP and hookah) and 0.5% in 2010 to 2.1% in 2018 (CTP and e-cig). **Conclusion:** After a significant decrease in the prevalence of using most types of tobacco/nicotine products in South Africa, prevalence of all products is beginning to increase in recent years. Tobacco use interventions to help users quit and prevent young people from initiating use are urgently needed to curb this increase.

FUNDING: Nonprofit grant funding entity

PS4-145

EXPLORING THE PRESENTATION OF JUUL-RELATED INFORMATION ON SOCIAL MEDIA: A SEMANTIC NETWORK ANALYSIS OF INSTAGRAM CONTENT

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Significance: Social media are important marketing platforms for e-cigarette promotion and are currently under-regulated. Posts featuring JUUL-related hashtags and marketing can increase exposure to pro-e-cigarette content and promote JUUL use among susceptible youth and novices. Existing studies on JUUL-related messages on social media have mainly concentrated on the text analysis using human coding and computational content analysis. No prior research has focused on the impact of dynamics between social players such as commercial account users, vape community members, and



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organic users from the networked perspective. The objective of the present study is to use semantic network analysis to investigate topics of JUUL-related posts in three user groups (commercial, community, and organic users) on Instagram. **Method:** A semantic network analysis of the words in JUUL-related posts on Instagram was conducted using Wordj 3.0 software. Network statistics of the Instagram JUUL-related messages were analyzed to characterize word co-occurrence patterns and hashtag functions by user group. Network analyses were run with and without inclusion of hashtags for each message. **Results:** Analysis of all words contained in posts (including hashtags) revealed that the largest cluster of terms was brand promotion for content posted by commercial users, brand engagement for community user posts, and youth social use of JUUL and other substances, such as marijuana and alcohol for organic user posts. Upon removal of hashtags, the largest cluster that emerged for commercial posts had to do with online and offline retailer promotion; for community posts—JUUL sales and promotion regrams; and for organic user posts—promotion and youth social use. **Conclusion:** JUUL-related commercial accounts mainly used hashtags to increase brand visibility and integrate with vape communities present on Instagram. Community accounts served as discursive intermediaries between commercial and organic users and fostered organic user brand engagement. Surveillance and regulation of the commercial branded content on social media might reduce electronic word-of-mouth, organic user-generated and community-generated promotion of nicotine and tobacco products.

FUNDING: Other

PS4-146

EXAMINING STRUCTURAL STIGMA AS A DRIVER OF SMOKING DISPARITIES AMONG SEXUAL MINORITY ADULTS

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Significance: Exposure to structural stigma (i.e., societal norms and policies that constrain access to resources) may explain higher smoking rates among sexual minority (SM) individuals. However, no recent studies have examined whether the relationship between stigma and smoking persists among SM adults and whether this association is modified by sex. Methods: We developed an index of SM structural stigma using principal components analysis to capture multiple state-level stigma indicators, including attitudes towards same-sex marriage; the density of same-sex couples; and policies regarding same-sex marriage, employment non-discrimination, and protection under hate crime laws. The outcome variable was current smoking, derived from adult respondents (ages 25 and older) from the National Adult Tobacco Survey (2012-2014). Poisson regression models stratified by SM status were used to explore the relationship between structural stigma and the relative risk of current smoking, with adjustment for individual and state-level socio-demographic factors, tobacco control policies, and year fixed effects. Non-linear relationships between stigma and current smoking were explored through the inclusion of a squared term for structural stigma. Interaction terms were used to examine modification of structural stigma effects by sex. Results: In adjusted models, the squared term for structural stigma was significant, suggesting a curvilinear relationship between stigma and the probability of smoking. Specifically, the highest and lowest exposures to structural stigma were associated with the lowest probabilities of smoking. This relationship was apparent for both SM and heterosexual adults, although it was more pronounced among SM individuals. There was no evidence of effect modification by sex for either SM or heterosexual adults. Conclusions: Our analysis suggests that structural stigma may be associated with smoking; however, the association may not be linear. Findings lend support to addressing SM structural stigma as a driver of smoking, particularly among SM adults.

FUNDING: Federal

PS4-147

DECIDETEXTO. SUPPORTING THE DEVELOPMENT OF A SMOKING CESSATION PLAN FOR LATINO SMOKERS

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Introduction Latinos, the largest minority group in the U.S., experience tobacco-related disparities, including low access to cessation resources. A computerized decision support tool has the potential to capture unique characteristics of smokers that can guide them through the development of an individualized cessation plan. **Objective** To describe the utilization of an interactive tablet-based software designed to guide the development

of an individualized cessation plan among Latino smokers. **Methods** Latino smokers (n=104) utilized a tablet-based decision support tool, available in English and Spanish, developed to address low-literacy levels. The tablet-based tool collected participant smoking-related information, including number of cigarettes smoked per day, primary reason to quit smoking, top two triggers and one strategy to manage each trigger. Participants were guided in the selection of pharmacotherapy (nicotine patches or gum) and asked to select a quit date. **Results** Mean age of participants was 46.4 years old (SD 10.7), 62.5% were men, 34.6% had less than high school education, and 46.1% had no health insurance. Participants were born in Mexico (27.8%), U.S. (20.1%), Ecuador (13.4%), and other countries (38.7%). The majority of participants smoked daily (91.3%), and 61.5% were light smokers (1-10 CPD). Most (74.0%) participants chose to complete the intervention in Spanish. Family and Health were the two main reasons for quitting (42.3% and 40.3%, respectively). Stress/Anger, Meals, and Social Events were the three main smoking triggers (21.6%, 17.7%, and 14.4%, respectively). Exercise, Chew Gum, and Go for a Walk were the three main strategies selected to manage smoking triggers (20.6%, 15.8%, and 7.2%, respectively). All participants selected a quit date and 99% requested pharmacotherapy (75% requested nicotine patches and 24% requested nicotine gum). **Conclusion** The tablet-based software provided a feasible tool to help Latino smokers develop an individualized quit plan and increase access to cessation resources. This intervention could be readily implemented in community- and clinic-based settings and reduce tobacco-related disparities among Latinos. **Funding** NIH R01CA212189

FUNDING: Federal

PS4-148

ASSOCIATIONS OF NICOTINE CONCENTRATIONS AND FLAVORS OF ELECTRONIC CIGARETTES AMONG ADOLESCENTS

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Significance: E-cigarettes contain e-liquids that are available in a multitude of nicotine concentrations and flavors. The aim of the current investigation is to examine the associations between e-cigarette nicotine concentration and flavors used among adolescents. Methods: Survey data were collected from four CT high schools in Spring 2017 (n=2896). Analyses were restricted to adolescents who reported current (past 30 day) e-cigarette use and indicated a nicotine concentration they typically used in their e-cigarette (n=426). Responses were categorized into three groups: no nicotine (0 mg/mL), low to moderate nicotine (≤ 12 mg/mL), and high nicotine (>12 mg/mL). Respondents indicated any e-liquid flavor used in the past 30 days from the following categories: alcohol, candy, coffee, fruit, menthol, mint, spice, tobacco, vanilla, or other. Separate adjusted logistic regressions were used to assess association between each flavor and nicotine concentration used controlling for demographic variables (age, gender, race, school) and prior ever use of cigarettes. Results: Students reported using no nicotine (25.1%), low to moderate nicotine (42.7%), and high nicotine (32.2%) e-liquids. Endorsing using mint or tobacco flavored e-liquids in the past 30 days was associated with using higher nicotine concentrations ($p < .05$). There were greater rates of use of mint flavor in the low to moderate (OR: 7.15; 95% CI: 2.83-18.1) and high nicotine concentration group (OR: 18.10; 95% CI: 6.32-51.83) compared to the no nicotine concentration group. Greater rates of use of tobacco flavor were observed in the high nicotine concentration group compared to the low to moderate concentration group (OR: 3.77, 95% CI: 1.58-9.00). Nicotine concentration was not associated with any other flavors. Conclusions: Findings indicate that adolescents who use higher nicotine concentrations in their e-liquids are more likely to use mint or tobacco flavored e-liquids. Understanding how flavor use is associated with nicotine concentration in e-cigarettes used by adolescents may inform efforts to reduce youth nicotine exposure.

FUNDING: Federal; Academic Institution

PS4-149

OVER HALF OF SAMPLED YOUNG ADULTS HAD USED JUUL, AND OVER HALF OF THOSE JUUL USERS HAD NEVER SMOKED A CIGARETTE

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Objective: The current study aimed to investigate JUUL by assessing knowledge, usage, risk perceptions, and susceptibility to future use in young adults. Further, the current study sought to determine what proportion of JUUL users had never smoked a conventional tobacco cigarette (CTC). Finally, the current study determined methodologically



whether using a general e-cigarette question would result in an underestimate of true JUUL use. **Method:** The current sample consisted of 525 young adults (median age 19, 77.33% female, 56.38% Non-Hispanic White) at a state university in the Southwest United States. A cross-sectional, non-random sampling design with an online survey was used, with data collected from November 2018 to May 2019. **Results:** Roughly 91% of the sample was aware of JUUL and lifetime prevalence of JUUL use was 54.62%. Over half (55.48%) of lifetime JUUL users had never smoked a CTC. JUUL ever users were more likely than their counterparts to perceive JUUL as both less harmful ($z = 5.27, p < .001, 95\%CI: [0.67, 0.82]$) and less addictive ($z = 2.43, p = .015, 95\%CI: [0.57, 0.85]$) than CTCs. Over one-third of JUUL never users (39.41%) were susceptible to future JUUL use. Finally, roughly 18% of participants who denied ever use of an e-cigarette nevertheless endorsed JUUL ever use. **Conclusions:** The vast majority of participants were aware of JUUL. Alarming, over fifty percent of the sample had used JUUL. Over 55% of JUUL ever users had never smoked a CTC, and around one-third of JUUL never users were susceptible to future JUUL use. Together, these data suggest that JUUL usage rates are high and may continue to rise in the future. Further, in this sample of young adults, for the majority of participants JUUL was not being used for smoking cessation. As expected, JUUL ever users viewed JUULing as less harmful and less addictive than CTC compared to their counterparts. Methodologically, around 18% of participants who denied "e-cigarette" use nevertheless endorsed JUUL ever use; this indicates that future research that aims to assess JUUL use should use JUUL specific terminology and avoid using "e-cigarette" terminology to obtain more accurate results.

PS4-150

ADHD DIAGNOSIS PREDICTS LIFETIME USE OF JUUL

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Background: Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by inattention, impulsivity, and hyperactivity that causes psychosocial dysfunction (APA, 2013). ADHD symptoms in young adults have been found to be associated with cigarette use (Glass & Flory, 2012; Kollins et al., 2005) and recent longitudinal research has identified that ADHD symptomatology is a significant predictor of electronic cigarette initiation (Goldenson et al., 2018). As JUUL has become the most widely used vape device, examining the relationship of ADHD and JUUL use is important and has yet to be determined. **Objective:** The purpose of the current study was to examine the association between ADHD diagnosis and JUUL use. It was hypothesized that ADHD diagnosis would predict both lifetime and past 30-day JUUL use. **Method:** A cross-sectional convenience sample of 525 young adults (median age 19; 77.33% female; 56.38% non-Hispanic White) was gathered at a university in the Southwestern United States, with data collected from November 2018 to May 2019. **Results:** The prevalence of self-reported diagnosed ADHD was 6.15%, lifetime JUUL use was 54.62%, and 30-day use was 29.90%. The results of two simple logistic regression analyses regressing JUUL ever use and 30-day JUUL, respectively, on ADHD diagnosis, indicated that ADHD diagnosis was a significant predictor of lifetime JUUL use (chi square (1) = 3.96, $p = .047$, OR = 2.23, 95%CI: [1.01, 4.92]) but not 30-day JUUL use (chi square (1) = 0.29, $p = .588$, OR = 1.27, 95%CI: [0.53, 3.04]). **Conclusions:** Lifetime ADHD diagnosis was a significant predictor of lifetime JUUL use. The current study is believed to be the first to date to report on the relationship between ADHD diagnosis and JUUL use, which is important given the popularity of JUUL. Future research should assess ADHD and JUUL use in non-college young adults and adolescents. Further, it would be important to examine the severity of current ADHD symptomatology using a more sensitive psychometric scale to examine if the continuum of symptoms of inattention, impulsivity, and hyperactivity is associated with increased likelihood of JUUL use.

PS4-151

IMPROVING MHEALTH STRATEGIES FOR SMOKING CESSATION: IDENTIFYING AND COUNTERING ENVIRONMENTAL CUES TO SMOKE

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Significance: Mobile-based interventions have been widely used in smoking cessation due to their increased affordability and accessibility. However, few studies have investigated how to use smartphones to monitor a smoker's socio-environmental contexts and counteract the impacts of environmental cues for smoking, particularly for low-income smokers. The goal of this research is to identify and categorize the different types of environmental cues for smoking in low-income communities and to discuss potential

mobile-based solutions to improve smoking cessation rates by disrupting the link between environmental cues and smoking behavior. **Methods:** Fifteen current smokers living in low-income communities were recruited and interviewed following a structured schedule. Guided by local smokers, we also scanned their surrounding neighborhoods to identify different types of cues that may trigger them to smoke. Frequency of each type of cue identified by participants was measured. **Results:** The cues were classified into four main categories: environmental, social, activity and internal cues. The most frequently mentioned environmental cues included exposure to advertisements of smoking-related products and cigarette packages. The top social cues included seeing other people smoking and seeing groups of people in social events. Common activity cues included eating, drinking alcohol, and drinking coffee. For internal cues, people smoked when they felt bored, angry or depressed. Smoking-related advertising was the most prominent and stationary environmental cue in low-income communities. **Conclusion:** Three types of mobile phone-based intervention are available to provide real-time support for smokers to resist temptations of smoking triggered by smoking cues: user-triggered, server-triggered and context-triggered approaches. We suggest user-triggered strategies will be most useful to address internal cues, which are generated internally by the smokers; server-triggered strategies will be most suitable in changing perceived social norms of smoking and habitual smoking behaviors to address social and activity cues; and context-triggered strategies will be most effective for counteracting environmental cues.

FUNDING: Academic Institution

PS4-152

JUUL IS NOT THE ENDS OF THE POD STORY - A SURVEY OF NON-JUUL POD DEVICES

Sumner Sydeaman, **Caroline North**, Paige Wiley, Kevin Madden, Madeline Cripe, Briar Stewart. Northern Arizona University, Flagstaff, AZ, USA.

Background: The newest generation of vape devices are pod-based, which are manufactured to not resemble previous generations of vape devices, are USB rechargeable, and use nicotine salts in pre-filled pod cartridges (Barrington-Trimis & Leventhal, 2018). JUUL, the most popular of the pod devices, has quickly spread, with the most recent published evidence indicating a lifetime JUUL rate of 44% in adolescents sampled in 2018 (Morean et al., 2018). Prevalence data on non-JUUL pod device use is sparse: ever use was 26.5% in adolescents (Morean et al., 2018), while ever use of flash drive-shaped pods specifically was 7.9% in a 2018 adult sample (Marynak et al., 2019). **Objective:** The purpose of the current study was to examine lifetime prevalence of JUUL and other pod devices. **Method:** A cross-sectional convenience sample of 525 young adults (Median age: 19, 77.33% female, 56.38% Non-Hispanic White) was gathered from a public state university in the United States, with data collected from November 2018 to May 2019. Participants were asked about ever use of JUUL and other non-JUUL pod-based devices. **Results:** Use of any pod device, including JUUL, was 60.11%. Lifetime JUUL use was 54.62% and lifetime non-JUUL pod-device use was 46.81%. Further, 65.71% of participants were poly-pod users (endorsed use of two or more pod devices). Over half of pod device users (59.28%) reported having never smoked a cigarette. Finally, a significant 13.81% of participants denied JUUL use but endorsed use of other pod device types ($z = 66.02, p < .001, 95\%CI: [0.09, 0.18]$). **Conclusions:** Almost two-thirds of the sample had ever used any pod device, with JUUL being the most widely used. Nevertheless, almost half of the sample endorsed use of a non-JUUL pod device as well, indicating that JUUL is not the only popular pod device on the market. Further, roughly two thirds of users were actually poly-pod users. Finally, a meaningful 13.81% of participants who had never used JUUL had used other pod devices, which suggests that researchers intending to survey pod device use should not assume that asking only about JUUL is sufficient, as it may underestimate actual pod device use.

PS4-153

TRENDS IN NICOTINE DEPENDENCE AMONG CIGARETTE SMOKERS WITH AND WITHOUT CANNABIS USE, 2002-2017

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Significance: Cannabis use is increasing in the United States (US). The prevalence of cannabis use is substantially higher among cigarette smokers relative to non-cigarette smokers. Some forms of cannabis administration expose individuals to nicotine (e.g., blunts) and this additional nicotine exposure could lead to increased vulnerability to developing nicotine dependence (ND). The current study examined trends in ND, using time to first cigarette on awakening (TTFC; defined as <30 minutes) as an indicator of ND, among cigarette smokers with and without past-month cannabis use, overall, and stratified by cigarettes per day (CPD), from 2002 to 2017.



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Methods: Data for this study were drawn from the 2002 to 2017 National Survey on Drug Use and Health (NSDUH), an annual cross-sectional survey of US individuals age 12 and older. Prevalence of TTFC and linear time trends of TTFC were estimated using logistic regression models with year as continuous predictor accounting for complex survey weights in SAS-Callable SUDAAN. Multivariable logistic regressions were then used to adjust for demographic covariates. **Results:** Among cigarette smokers with cannabis use, overall, TTFC did not change from 2002-2017. However, after stratifying by CPD, an increase in TTFC was observed among cigarette smokers at all levels of CPD (1-5, 6-15 and 16+); the increase was most rapid among those smoking 1-5 CPD ($P_{int} < 0.001$). Among cigarette smokers who did not use cannabis, overall, the prevalence of TTFC declined. After stratifying by CPD, TTFC increased significantly among those with 1-5 and 6-15 CPD but there was no change in the prevalence of TTFC among cigarette smokers with 16+ CPD from 2002 to 2017. **Conclusions:** Nicotine dependence may be increasing more rapidly among cigarette smokers who use cannabis, relative to those who do not, especially at lower levels of cigarette consumption. Increased attention to cannabis use among smokers is warranted given the changing substances use landscape in the US.

FUNDING: Federal

PS4-154

EXPLORING MENTAL HEALTH AND DENTAL ROOT CARIES AMONG ADULT TOBACCO USERS, NHANES 2015-2016

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Significance: Poor mental health and tobacco use are independently linked to poor oral health. However, the relationship between depressive symptoms and oral health outcomes, particularly among tobacco and non-tobacco users, are limited. **Methods:** The nationally representative cross-sectional data, 2015-2016 National Health Nutrition and Examination Survey (NHANES, N=5159), was used to examine the association of depressive symptoms with perceived and examined oral health among tobacco and non-tobacco users. Depressive symptoms (none vs. moderate/severe) were derived from the Patient Health Questionnaire (PHQ-9). Current tobacco use was assessed as any type of tobacco use in the past-5 days. Oral health outcomes were ascertained through perceived oral health (poor to excellent) and through a comprehensive exam by a trained and licensed dentist (presence of root caries). Weighted univariate and multinomial regression models adjusted for age, gender, education, ethnicity, health insurance, federal poverty level, and 1-year dental visit. **Results:** Among non-tobacco users, 20% revealed symptoms of depression, 9% reported fair to poor oral health, and 18% examined as having root caries. However, 42% of current tobacco users reported depressive symptoms, majority of whom reported fair to poor oral health (93%) and were diagnosed with root caries (50%). Compared to non-tobacco users with no depressive symptoms, tobacco users with depressive symptoms were more likely to perceive their oral health to be poor ($p < 0.001$) and develop root caries ($p < 0.001$). **Conclusion:** Findings suggest a relationship between depressive symptoms and poor oral health outcomes among tobacco users, further advocating for programs that address both behavioral and psychosocial determinants affecting oral health among U.S. adults.

FUNDING: Unfunded

PS4-155

A PILOT RANDOMIZED CLINICAL TRIAL OF BRIEF MOTIVATIONAL INTERVENTIONS IN SMOKERS FROM SOCIOECONOMIC DISADVANTAGE

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Significance: Smoking and the associated negative health effects disproportionately impacts communities of socioeconomic disadvantage. It is imperative that we provide this vulnerable population with brief evidence-based interventions to address this disparity. **Methods:** Daily smokers (N=58) attending a community soup kitchen were randomized to receive Motivational Interviewing (MI; 30 minutes), Nicotine Replacement Therapy (NRT) sampling, or referral only. We hypothesized that smokers randomized to MI would be more likely to engage in evidence-based treatment, make a serious quit attempt, and reduce cigarette consumption. **Results:** The one-month follow-up was attended by 91.4% of participants, with no differences between groups. Participants lost to follow-up were presumed to be smoking and baseline data (e.g., daily cigarette consumption) was carried forward. At follow-up, participants randomized to the NRT condition were significantly more likely to use NRT (42.1%; $\chi^2(2)=10.0, p < 0.01$; Cramer's V=0.42, large effect) than participants randomized to the MI (5.3%) or referral only (10.0%) conditions.

Post-hoc analyses were conducted to investigate the role of subjective financial strain on changes in cigarette consumption by condition. A significant interaction between condition and financial strain was found, which accounted for 10.8% of the variance in smoking reduction at follow-up ($F(1, 52)=6.66, p=0.01; \eta^2=0.12$, small-medium effect). Specifically, a greater reduction in smoking was observed for participants randomized to NRT who reported greater subjective financial strain. Conversely, a greater reduction in smoking was observed for participants randomized to MI who reported less subjective financial strain. **Conclusion:** Even among a sample including only smokers of socioeconomic disadvantage, the experience of financial strain is an important consideration. Providing free NRT may be especially important for those experiencing the greatest levels of subjective financial strain. It is unclear why MI was most effective in those with lower financial strain, though validating participants' experiences of financial strain in MI interventions may be important.

FUNDING: Academic Institution

PS4-156

THE CO-DESIGN OF A MOBILE HEALTH APPLICATION WITH AUSTRALIAN INDIGENOUS WOMEN FOR FAMILY RESPIRATORY HEALTH

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Significance: Respiratory illness is the leading cause for hospitalisation among Australian Indigenous children. Rates are much higher compared to non-Indigenous children (78 per 1,000 compared with 48 per 1,000). Exposure to environmental tobacco smoke is a significant risk factor. Indigenous Australians are almost three times more likely to smoke compared to non-Indigenous Australians (45% versus 16%). Families want to be smoke free, but face barriers. The purpose of this study is to co-design a mobile health (mHealth) application (app) for family respiratory health that is culturally safe and accepted by Indigenous families. **Methods:** Co-design methodologies are particularly suitable among Indigenous populations. Indigenous women and health staff from three regions in New South Wales Australia were invited to participate. Co-design workshops were co-facilitated by Indigenous and non-Indigenous researchers and an app developer. Workshops were used to identify 1) health needs and aspirations, 2) barriers to accessing and achieving health, and 3) corresponding mHealth solutions. Thematic analysis was completed. A prototype for pre-testing was developed based on a triangulation of concepts generated in workshops, behaviour change techniques, and best practice evidence. **Results:** Three Indigenous community researchers led engagement. Thirty-one women and nine health staff participated in co-design workshops. Health needs and aspirations identified include holistic, family centred, building connections, reliable information, easy access, local context, no judgement and empowerment. Barriers identified include fear of child being removed/reported, mistrust, shame, racist treatment, conflicting daily stresses, time poor and health literacy. Corresponding mHealth solutions include social proof (advice from trusted sources), wide-ranging health modules (e.g. childhood respiratory health, smoking cessation, social emotional well-being, nutrition, and exercise), family access, social connections (Chat) and "Doctor in my pocket" (Ask a nurse). **Conclusion:** A co-designed mHealth app may be an accepted tool among Indigenous families for respiratory health, smoking cessation and a range of other health topics. Further research is needed to determine if an mHealth app is effective at changing health knowledge and behaviour for improved Indigenous family respiratory health.

FUNDING: State; Academic Institution; Nonprofit grant funding entity; Other

PS4-157

TRENDS IN CIGARETTE USE BY STATE LEVEL CANNABIS LEGALIZATION FOR MEDICAL AND RECREATIONAL USE IN THE UNITED STATES, 2004-2017

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Significance: Use of cannabis and tobacco is intimately intertwined. The rapidly increasing legalization of cannabis in the US may impact use of tobacco, either via substitution or complementarity. The goal of the current study is to examine the prevalence of daily and non-daily cigarette use by state-level cannabis legalization and to investigate trends in cigarette use in states that have adopted medical marijuana laws



(MML) (no recreational marijuana laws (RML)) vs. those with RML as compared to states without MML or RML using difference-in-difference (DID) approach. **Methods:** Data were drawn from the restricted access 2004-2017 National Survey on Drug Use and Health (NSDUH). The prevalence of past-month (daily and non-daily) cigarette use was estimated by survey year and MML/RML status from 2004 to 2017. Annual trends were estimated by MML/RML status. Difference-in-difference estimates were calculated using two-way fixed effects for year and state. Adjusted models included individual covariates for age, race/ethnicity, sex, income, education and a state-level measure of tobacco control. **Results:** Overall, there was no difference in the prevalence of non-daily smoking (8.9% for RML, 8.7% for MML, and 9.0% for no MML) by MML/RML status in 2017. The prevalence of daily smoking was significantly lower in states with RML (10.7%), compared to states with MML (14.0%) or no MML (14.8%) ($p < 0.001$). Using a DID approach, there was no change in the prevalence of daily smoking from 2004 to 2017 in states with MML (OR=0.98, 95% CI (0.93-1.02) nor RML (OR=0.93, 95% CI (0.85, 1.03)). This was true among nearly all demographic strata, however, among states with MML implementation, daily smoking significantly declined among those aged 12-17 and 18-25 as well as among females. In states with RML implementation, daily smoking did not decline among any demographic groups from 2004 to 2017 except among females and non-Hispanic whites. Non-daily smoking declined overall in states with RML adoption (OR=0.90, 95% CI (0.82, 0.99)), but there was no change in non-daily smoking among states that adopted MML from 2004 to 2017 except for a observed decline among those who were never married and among non-Hispanic whites. **Conclusions:** Results so far suggest that changes in non-daily use may be closely intertwined with RML passage but that the relation between MML passage and cigarette use is less clear. Continued monitoring of trends in cigarette and other tobacco use by state-level MML/RML passage is warranted.

FUNDING: Federal

PS4-158

USING GROWTH CURVE MODELLING TO ELUCIDATE THE ROLE OF AFFECT IN SMOKING CESSATION

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Background: It is well known that positive affect (PA) and negative affect (NA) are associated with smoking cessation. Yet, little is known about how changes in affective states may contribute to smoking abstinence. **Methods:** This study used longitudinal data to examine the associations between PA and NA and smoking abstinence during a planned quit attempt. Data from a pilot three-armed randomized clinical trial of a smartphone-based smoking cessation intervention among adults (N=81) were used. Participants were asked to complete in-person computer-based surveys at four visits (baseline, quit date, 4 weeks post-quit and 12 weeks post-quit). The Positive and Negative Affect Schedule (PANAS) was used to assess PA and NA. Seven day point prevalence smoking abstinence at 12 weeks post-quit was assessed using self-report and confirmed via a carbon monoxide monitor. Multilevel growth curve models were conducted to estimate the association between PA and NA and smoking abstinence controlling for age, sex, education, race (White vs. non-White), study group, and heaviness of smoking at baseline. **Results:** Participants were primarily male (51.2%), White (67.9%), and 49.4 years old (SD=12.2). Overall, 17.3% of participants were confirmed abstinent at 12 weeks post-quit. Results indicated that participants whose PA increased throughout the trial were more likely to be abstinent while those whose PA decreased were less likely to be abstinent at 12 weeks post-quit ($\beta = -2.78, p = .003$). In contrast, participants whose NA decreased throughout the trial were more likely to be abstinent while those with increased NA were less likely to be abstinent ($\beta = 1.36, p = .02$). **Conclusion:** Decreasing PA and increasing NA may contribute to smoking relapse. Future smoking cessation interventions that detect and intervene to increase PA and decrease NA may increase cessation success.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PS4-159

TOBACCO 21 LAW COVERAGE, COMMUNITY CHARACTERISTICS, AND THE POTENTIAL FOR EXACERBATING SMOKING DISPARITIES

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Introduction: To combat youth smoking in the US, some states, counties, and local governments have raised the minimum legal purchasing age for tobacco products to 21 (i.e., Tobacco 21). Recent evidence supports the effectiveness of this strategy for reducing teen smoking. However, little is known regarding the sociodemographic composition of communities that have passed Tobacco 21, which is critical to understanding the potential health equity implications of this policy. **Objectives:** To characterize the current landscape of Tobacco 21 policies in the United States and investigate the potential for exacerbating smoking disparities. **Methods:** We conducted an ecologic analysis using Poisson Regression with county-level population offsets to examine the relationship between county characteristics (i.e., region and sociodemographic composition), and Tobacco 21 passage as of June 30, 2019. Data sources include the 2017 Census Cities and Towns database, the 2017 American Community Survey and the University of Missouri Tobacco Control Research Center's Tobacco 21 Database. **Results:** As of June 30, 2019, roughly 167 million people across 29 states and Washington D.C. - or about 51% of the US population - lived in a county that was at least partially covered by a Tobacco 21 policy. Our findings suggest regional gaps in Tobacco 21 passage exist, with the Pacific region having the highest population percentage covered (98.63%) and the East South Central Region having the lowest (0.08%). Regarding sociodemographic composition, Tobacco 21 passage was less likely in counties with larger percentages of individuals living below the poverty line (RR 0.58, 95% CI: 0.46-0.74), larger percentages of the non-Hispanic Black population (RR 0.78, 95% CI: 0.70-0.87), and larger percentages of the Hispanic/Latino population (RR 0.85, 95% CI: 0.80-0.92), when controlling for all other variables. **Conclusions:** Likelihood of being covered by Tobacco 21 policies varies by region, socioeconomic status and racial/ethnic composition. More research is needed that considers consequences for smoking disparities as policies continue to be implemented.

FUNDING: Federal

PS4-160

NON-SMOKER'S EXPOSURE TO SECOND-HAND SMOKE IN SOUTH AFRICA- RESULTS FROM THE 2017 SOUTH AFRICAN SOCIAL ATTITUDE SURVEY

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Significance: Exposure to second-hand smoke (SHS) is the most common indoor air pollutant globally. About 600,000 non-smokers die annually as a result of diseases caused by exposure to SHS. This study investigates non-smokers' exposure to SHS in selected indoor places in 2017 based on results from a national survey; the South African Social Attitude Survey (SASAS). Four locations were investigated in this study and include: workplaces; homes; cafés and restaurants; shebeens (local bars), bars and clubs. **Methods:** Data were analyzed using STATA version 15. All analyses involving exposure to SHS were conducted for non-smokers only. Current smokers were those using any combustible tobacco product (manufactured cigarettes, roll your own tobacco, cigars, and pipes) or hookah. Percentages and proportions were used to describe the general sample and data on exposure to SHS. Any exposure to SHS was described as exposure to any of the four categories of indoor places investigated. Level of exposure to SHS was determined by a scale derived from computing all locations where participants were exposed with 0, 1, 2, 3 and 4 places exposed categorized as: no, low, moderate, high and very high exposure, respectively. Factors associated with any exposure and level of exposure were explored using logistic and ordinal logistic regression analyses. **Results:** The sample comprised 3,063 participants aged 16 years and above. Majority of the participants were females (51.7%, n=1864), and black Africans (78.5%, n=1872). Married and never married participants made up 38.6% (n=1254) and 51.2% (n=1189) of the participants respectively. Current smoking prevalence was 21.5% while more than half (55.0%) of non-smokers reported being exposed to SHS in at least one location. Females, adults aged 45-54yrs, 55-64yrs and 65yrs and above were significantly less likely to be exposed to SHS (aOR=0.64; 0.56; 0.54;0.23) compared to males. Those who from the coloured race group were significantly more likely to be exposed to SHS (aOR=1.6) compared to blacks. Factors associated with level of exposure to SHS include: gender (female; aOR=0.57), Race (coloureds; aOR= 1.41), Age (55-64 years; aOR= 0.50, and 65+ years; aOR= 0.24). **Conclusion:** Over half of the non-smoking population reported being exposed to SHS despite South Africa's smoke-free policy, though current tobacco control law allows for designated smoking areas in some indoor places. A 100% smoke-free policy will protect more people from exposure to SHS in South Africa.

FUNDING: Nonprofit grant funding entity



PS4-161

NORMATIVE BELIEFS ABOUT THE SOCIAL ACCEPTABILITY OF SMOKING AND ASSOCIATIONS WITH QUITTING BEHAVIOUR FINDINGS FROM 2016-2018 ITC NEW ZEALAND SURVEY

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Background: Normative beliefs about the prevalence and social acceptability of smoking has been found to influence quitting behaviours. However, concentration of smoking within population sub-groups may create smoking norms and beliefs that reinforce smoking practices within these groups, and exacerbate smoking disparities. This study explored whether higher exposure to smoking in social networks was associated with smoke-free normative beliefs (SFNB) about smoking. **Methods:** Data came from Wave 2 (n=726 smokers) of the International Tobacco Control (ITC) New Zealand Survey conducted in 2018. We assessed SFNB by measuring smokers' perceptions of: disapproval of smoking; whether smoking helps people to socialize; smoking prevalence; and feelings of being stigmatized because they smoked. Analysis was stratified by degree of exposure to smoking in social networks. If at least four of a respondent's five closest friends smoked or if they were exposed to other peoples' cigarette smoke four or more times a week over the past month, they were allocated to the high exposure (HE) to smoking in social network group. All other participants were allocated to the lower exposure (LE) group. **Results:** Significantly fewer respondents with high exposure to people smoking in their social networks agreed that people they knew disapproved of smoking (HE 37% agreement c.f. LE 58% agreement), hid their smoking from family and friends (HE 22% agreement c.f. LE 30% agreement) or thought the number of smokers in their social groups was declining (HE 49% agreement c.f. 77% agreement). No significant differences were found in relation to feelings of being stigmatized because they were a smoker. **Conclusion:** Results suggest exposure to higher levels of smoking within social networks is associated with lower levels of SFNB. For population sub-groups where smoking prevalence is higher, exposure to others' smoking may be a barrier to quitting and hence exacerbate smoking disparities. Population level interventions designed to create SFNBs should take in to account the influence of higher smoking prevalence within priority groups.

FUNDING: Federal; Nonprofit grant funding entity

PS4-162

TRENDS IN MENTHOL CIGARETTE SMOKING AMONG US CURRENT SMOKERS, 2003-2015

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SIGNIFICANCE: Prior research has documented the potential harms of menthol cigarette use including increased smoking initiation, greater addiction potential, and less successful cessation attempts than with non-mentholated cigarettes. In recent years, the proportion of cigarette smokers in the US population has declined, yet trends in regular menthol cigarette smoking have been understudied. This work examines cross-sectional trends in the prevalence of menthol cigarette smoking among current smokers by selected demographic factors, including sex, age group, race and ethnicity, employment, metropolitan status, geographic location and education using data from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS). **METHODS:** The TUS-CPS is an NCI-sponsored, nationally-representative triennial survey of tobacco use that is part of the US Census Bureau's and Bureau of Labor Statistics' annual CPS. Four cycles of TUS-CPS data (2003, 2006-2007, 2010-2011 and 2014-2015) were analyzed in SAS/SUDAAN. Nationally-representative, unadjusted estimates and predicted marginals adjusted for a series of demographic variables were calculated to examine menthol smoking patterns among current smokers. Linear contrasts assessed statistically significant changes over time. **RESULTS:** Menthol smoking among current smokers increased from 28% in 2003 and 2006-2007 to 33% in 2014-2015 (p<0.001). Across every cycle, more than 70% of non-Hispanic Black smokers indicated their usual cigarette type was mentholated, increasing to 80% by 2014-2015 (p<0.001). Young adults (ages 18-24), females, and those living in the Northeast were more likely to report menthol smoking and showed significant increases in use (p<0.001). **CONCLUSIONS:** Menthol cigarette use has adverse tobacco control consequences and certain groups are disproportionately more likely to smoke menthol cigarettes. While there have been smoking reductions in

recent years, they have mainly come from non-menthol smokers and smokers without a regular type of cigarette. There were significant changes in menthol smoking amongst most subgroups, indicating more research on menthol use is warranted.

FUNDING: Federal

PS4-163

TRACKING THE EVOLVING RELATIONSHIP BETWEEN TOBACCO, MARIJUANA, AND E-CIGARETTES USING REDDIT

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The relationship between tobacco, marijuana, and e-cigarettes is both rapidly changing and poorly understood, with consumers increasingly transitioning between all three product types. Social media (in this case, Reddit) provides abundant, publicly accessible, first person narratives with which to understand these transitions. We collected Reddit data from nine subreddits (i.e. topically focused discussion forums) related to marijuana, tobacco, and e-cigarettes (including r/vaping, r/stopsmoking/, and r/trees), from 2013 to 2018 (767,788 threads and 7,645,481 posts in total). We observed that the number of threads increased year-on-year for subreddits related to tobacco, marijuana, and smoking cessation. The volume of e-cigarette related posts peaked in 2015 and subsequently declined slightly. Given the rapidly changing market for e-cigarette and marijuana brands and products, and difficulties associated with manual curation of terms in the context of a very large dataset, we utilized a word2vec model (i.e. a shallow neural network) to identify relevant synonyms and brand-related terms. Using this method, we identified over 30 novel e-cigarette brand names for subsequent tracking. As our goal was to identify user trajectories through the three product categories, we computed the proportion of posts in which at least two product types were mentioned (e.g. e-cigarettes and combustible tobacco use). We found that in r/stopsmoking -- a subreddit devoted to providing advice to support smoking cessation attempts -- 7.1% of posts mentioned the use of multiple products, with a typical scenario consisting of an individual using e-cigarettes as a means of quitting combustible tobacco use. In contrast, the proportion of posts containing references to multiple product types was substantially lower for r/vaping (2.8%) and r/marijuana (5.2%). Finally, in addition to the quantitative work described above, we will also report on the results of a qualitative analysis of 2,000 Reddit posts, with the goal of further characterizing user transitions between product categories.

FUNDING: Federal

PS4-164

THE POTENTIAL FOR INFECTIOUS DISEASE TRANSMISSION AMONG WATER PIPE USERS OF LAO PDR

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Significance: Tobacco users in Asia are 4.5 times likely to die from tuberculosis than non-smokers due to the weakened defenses of a smoker's respiratory epithelium. Other infectious disease exposure factors could exacerbate infection by *Mycobacterium tuberculosis*. This study evaluates the water, sanitation and hygiene factors unique to the Tobacco Waterpipe (TWP). We tested smoking practices and water quality of the TWP among 43 smokers of five villages in rural Lao PDR Luong Namtha province. **Methods:** The team collected water samples from each participant's TWP and assessed them for the growth of *E.coli*, Total Coliforms and Total Aerobic bacteria. Each participant interview discussed sanitation and hygiene topics associated with smoking of homemade TWP that can contribute to infectious disease transmission among rural adults who are already at high risk of infection. **Results:** Cleaning of the TWP after each smoking session was infrequent (82.3% reported no cleaning of the TWP, and 85.3% reported not changing the water). Exposures proximal to the TWP use added further modes of transmission and included: no hand-washing with running water+soap (97.6%), cleaning latrines (41%), livestock handling (87.8%), and exposure to particulate matter (second hand smoke (100%), household air pollution (55.8%), crop dust (90.2%)). In a self-reported health assessment, 24.4% indicated a chronic cough with sputum, and 14.6% reported a past or active case of TB. The microbial indicator testing results were 83% positive for the 3M Petrifilm™ aerobic plate count, 38% positive for coliforms, and 12% positive for the *E.coli* indicator. The concentrations were highest for the aerobic plate count with an average of 1x10⁶organisms ml⁻¹. The coliforms were less than 100 organisms ml⁻¹ and the *E.coli* samples were all less than 10 organisms ml⁻¹. The TWP were observed with a high occurrence of gram negative bacterial indicators because



they were heavily used, were warm, had yellow colored water, were infrequently cleaned and allowed a dark environment for bacteria to grow on an internal porous bamboo material. **Conclusion:** These pilot study findings indicate the possibility that the TWP use adds several unstudied modes of transmission to a complex and common biobehavioral and environmental framework of pathogen exposure in rural Southeast Asia. The infectious disease burden of TWP use in this environment needs measurement in larger samples, and will have implications for both tobacco control and community development. Funding: 5R03TW007345-03, 2R01TW005964-06

FUNDING: Federal

PS4-165

ADDRESSING TOBACCO USE IN THE COMMUNITY MANAGED MENTAL HEALTH SECTOR A CLUSTER RANDOMISED CONTROLLED TRIAL OF AN ORGANISATIONAL CHANGE FRAMEWORK

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Significance: There is an urgent need to reduce the prevalence of tobacco use amongst people experiencing severe mental illness. Community managed mental health organisations (CMOs) are well placed to offer smoking cessation care but require additional support to do so. This study aimed to assess the effectiveness of an organisational change intervention to increase the provision of smoking cessation care by staff working in CMOs. **Methods:** A cluster randomised controlled trial was implemented in 26 CMOs in NSW, Australia between 2018-2019. Guidelines were developed to assist CMOs in identifying organisational changes required to address tobacco use. Intervention services received a financial grant, face-to-face and online training, and proactive monthly support to support implementation of the guidelines. Active control services received online training and generic, scheduled support via email. Outcome and process measures were assessed via online and hardcopy surveys at baseline, six and nine months follow up. The primary outcome was the proportion of CMO staff offering nicotine replacement therapy (NRT) to consumers (measured by consumer self-report). Secondary outcomes at the consumer (smoking cognitions and behaviour), staff (practices and attitudes) and organisational level (policies, procedures and systems) were also measured. **Results:** Intervention services achieved goals within their project plans more frequently than active control services, however services' performance did vary within and between conditions. Rates of offering NRT, and biochemically verified 7-day point prevalence and continuous abstinence will be reported. **Conclusion:** The organisational change intervention appears to increase the capacity of a CMO to address smoking cessation with their service users and adopt recommended guidelines to improve the quality of smoking cessation care provided to service users. This approach has the potential to reduce the disproportionate health and economic burden of tobacco use experienced by people living with a severe mental illness.

FUNDING: State; Nonprofit grant funding entity

PS4-166

HOW CLOSE IS TOO CLOSE - JUUL RETAILER PROXIMITY TO HIGH SCHOOLS

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SIGNIFICANCE:

Youth use of electronic nicotine delivery systems is epidemic in the US, largely due to the popularity of JUUL. Many studies highlight an association between youth tobacco use and proximity of tobacco retailers near schools. Given JUUL Labs' claims of commitment "...to combating youth use of vapor products", we assessed the proximity of JUUL retailers to high schools. **METHODS:** In July 2019, we randomly selected 25 cities from CDC 500 cities. For each city, we obtained lists of JUUL retailers, using the "store locator" page on the JUUL website, and public high schools, using the National Center for Education Statistics (NCES) website. We geo-coded addresses for JUUL retailers (n=610) and high schools (n=158) in ArcGIS. ArcGIS proximity analysis was used to identify retailers within a .5, .75, and 1-mile radius of public high schools. **RESULTS:** Nearly 25% of study cities had more than half of JUUL retailers located within one mile of a high school. Over one-third of all JUUL retailers were located within one mile of a high school. Roughly 35.4% of high schools were located within one mile of multiple JUUL retailers. **CONCLUSION:** JUUL remains available for retailers to sell in close

proximity to high schools, which questions JUUL's commitment to preventing youth from using their products. Stopping product sales near high schools may reduce youth access and retailer age restriction violations.

FUNDING: Unfunded; Academic Institution

PS4-167

SUCCESSFULLY CONNECTING WITH AT-RISK GROUPS DOES NOT COMPROMISE A MESSAGE'S RECEPTIVITY AMONG THE GENERAL POPULATION

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Significance: Mass media can be an effective tool in reducing disparities. It is well known that many at-risk groups tend to have disproportionately higher rates of tobacco use. The concentrations of use within these groups underscore the importance reaching at-risk groups. However, finite social marketing budgets dictate that a balance must be struck in appealing to at-risk groups and relevance to the general population. **Methods:** Truth produces and pre-market tests dozens of ads annually, aimed at youth in the general public, but with an eye on issues that affect at-risk groups. Digital ads from the truth® campaign were selected, featuring influencers from the African American and LGBTQ communities, mental health advocacy messages, and voices from low income communities. Using a model to predict the efficiency of the ads based on their top 2 box responses in receptivity, intention to visit theruth.com, desired behavioral outcome, likeability, and recall of the main idea, we compared the metrics of the at-risk population to its general population counterpart. **Results:** As expected, the at-risk groups likely to identify with the ad content over-index with the relevancy statements, such as "the ad is for young people like me," by as many as 9 percentage points. However, the general population counterpart performs at or above expected general population benchmarks overall. For example, on the statement "This ad captured my attention" we find that the ads deliver 3% to 8% higher than the expected benchmark. We see this pattern throughout, indicating that, for most people, ads can feature people unlike themselves, and can contain a message to which they don't identify, yet can still be relevant. **Conclusions:** Reaching out to at-risk groups with influencers and targeted digital ads can have a role in reducing disparities while achieving high message receptivity across the general population. Our conclusion is that campaigns should not fear diluting their message or compromising their brand by reaching out to at-risk groups. By allocating portions of their resources to targeted digital advertising and influencers within at-risk communities the connection can be made without sacrifice to the message relevance to the general population.

FUNDING: Other

PS4-169

THE MEDIATING EFFECTS OF MENTAL HEALTH AND SMOKING, AND THE MODERATING EFFECTS OF DRINKING ALCOHOL IN THE RELATIONSHIP BETWEEN ASTHMA AND ELECTRONIC CIGARETTE USE

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Significance: Asthma is associated with a higher risk of bad mental health, alcohol drinking, and smoking and vaping initiation. The purpose of this study is to examine the functions of mental health and smoking as mediators and alcohol drinking as a moderator on the relationship between asthma status and e-cigarette. **Methods:** Data from the 2017 Youth Risk Behavior Surveillance System and the 2017 Behavioral Risk Factor Surveillance System were analyzed. The structural equation modeling and logistic regressions analyses were conducted. **Results:** The results showed that the relationship between asthma and e-cigarette ever use was mediated by mental health among adults (Indirect effect: B= 0.01, SE = .001, 95% CI 0.12, 0.14); asthma was a significant predictor of bad mental health, and the bad mental health was a significant predictor of e-cigarette use. Further, the relationship between asthma and e-vapor ever use was mediated by ever smoking among adolescents (Indirect effect: B= -.05, SE = .007, 95% CI (-.061, -.034)); asthma was a significant predictor of ever smoking, and that ever smoking was a significant predictor of e-vapor ever use. It was also demonstrated that both asthma and binge drinking were significant predictors for both adults and adolescents, there was a significant interaction suggests that ever alcohol drinking has a moderating effect on the relationship between asthma and e-vapor ever use among youth with controlled for potential confounders (B = -.40, SE = .11, p=.001), but it was not significant for the adults (B = .01, SE = .01, p=.404). **Conclusion:** The findings indicated that the relation-



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ship between asthma status and e-cigarette use was mediated by mental health and smoking. It was also presented that alcohol drinking has a moderating effect on the relationship between asthma and e-vapor ever use among adolescents.

PS4-170

ENVIRONMENTAL AND CONTEXTUAL PREDICTORS OF ECIG AND TOBACCO USE SUSCEPTIBILITY AMONG ADOLESCENTS

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Studies show that e-cig and tobacco cigarette susceptibility (intentions and willingness) predict future e-cig and tobacco use. Research suggests that environments favorable to e-cig use may increase susceptibility to future e-cig use and tobacco use among adolescents, but little is known about the predictors of e-cig and tobacco use susceptibility. This study used EMA to investigate daily predictors of e-cig and tobacco cigarette susceptibility over time. Our sample comprised 50 adolescent vapers (ages 14-17) who completed daily surveys over 14 days (700 observations). Surveys asked about context of vaping, motivations for vaping, exposure to e-cig marketing and others' e-cig use, and intentions and willingness to use e-cigs and tobacco cigarettes the next day. Adolescents reported intending to vape the next day on 47% of occasions and intending to smoke on 16%. On average, they were "willing" to vape and "somewhat willing" to smoke the next day. We used multi-level models to examine predictors of susceptibility from risk factors collected the same day. Intentions to vape the next day were predicted by a greater number of total puffs, vaping high nicotine strength (18 mg or greater), vaping with their own device, vaping alone, vaping at home, vaping because it feels good, and greater exposure to adults and peers vaping, e-cig warning messages, and e-cig advertising. Intentions to smoke tobacco the next day were predicted by less exposure to e-cig advertising. Willingness to vape the next day was predicted by a greater number of total puffs, vaping because of appealing flavors, vaping to help quit smoking cigarettes, and exposure to e-cig advertising. Willingness to smoke the next day was predicted by vaping with their own device, vaping because of no odor, and exposure to e-cig advertising. Results provide predictors of e-cig and tobacco use susceptibility that can help inform policy and real-time interventions and ensure effective targeting of adolescents susceptible to e-cig and tobacco use. In addition, results can help clarify how risk factors are differentially associated with intentions and willingness, two common measures of susceptibility.

FUNDING: Federal

PS4-171

PHYSICIAN PERSPECTIVES ABOUT E-CIGARETTES USE, COUNSELING AND RECOMMENDATIONS AMONG SMOKERS AND E-CIGARETTES USERS IN MEXICO

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Significance: Physician counseling about the potential role of e-cigarettes for harm reduction and quitting all tobacco products may be critical to realizing the potential public health benefits of e-cigarettes. Our study describes the frequency and correlates of smokers' discussions about e-cigarettes with their health professionals. **Methods:** Cross-sectional data were analyzed from Mexican adult smokers recruited from an online commercial marketing research panel. Participants (n=3,057) were asked if they had a medical consult in the prior 4 months, and, if so, whether they discussed e-cigarettes. Those who discussed e-cigarettes were asked who raised the topic and whether the physician recommended their use. Among those who visited a doctor, logistic regression models estimated the sociodemographic and tobacco use correlates of discussing e-cigarettes. In the group who discussed e-cigarettes, logistic models estimated the correlates of the physician bringing up the topic and, in a separate model, recommending their use. **Results:** Of the 32.1% of participants who had a medical consultation in the last 4 months, 34.2% discussed e-cigarettes. Discussion was much more likely if participants used e-cigarettes (Adjusted Odds Ratio [AOR] =6.04; 95% CI-4.32, 8.43), daily smokers (AOR=1.6; 95% CI- 1.06, 2.4) compared to those who do not smoking daily, having recently attempted to quit smoking (AOR= 3.14; 95% CI-2.26, 4.37), and being a male (AOR=1.73; 95% CI-1.25, 2.39). Of those who discussed e-cigarettes, 54.6 % reported that the physician brought up the topic and

47.8% recommended their use. Independent correlates of the physician bringing up the topic included e-cigarette use (AOR=1.72; 95% C.I. 1.02, 2.89) and lower educational attainment (AOR=0.37; 95% C.I. 0.15-0.9). We haven't found independent correlations of recommending their use during medical consultation. **Conclusions:** Discussions of and recommendations to use e-cigarettes by physicians appear prevalent in Mexico, particularly amongst smokers who also use e-cigarettes. Future studies should assess whether e-cigarettes discussions facilitate smoking cessation, including harm reduction.

FUNDING: Federal

PS4-172

PREPARING FOR A QUIT ATTEMPT: WHAT CHARACTERISTICS ARE ASSOCIATED WITH TIME PREPARING?

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INTRODUCTION: Preparation is an important component of cessation. In many cessation text-messaging programs, time preparing to quit (i.e., messages sent before the quit day) is constant for all users, regardless of their specific wishes. Thus, the impact of choice in preparation when using technology-based interventions is not well understood. The National Cancer Institute's cessation text-messaging program, SmokefreeTXT, allows users to select a quit date, providing an opportunity to explore the impact of choice during the preparation period. This study identified factors associated with length of preparation, and retention in the preparation phase. **METHODS:** At enrollment, SmokefreeTXT users were asked to describe their smoking frequency (every day or less than everyday), frequency around other smokers (often or less often), self-efficacy to quit (high or not), and intention to be smoke free in one year (high or not). Negative binomial and logistic regression, adjusting for age and gender, were used to determine user characteristics associated with number of days selected for preparation (days from enrollment to quit day, range: 0-14) and retention during the preparation phase (made it to quit date, yes/no) among 5,547 users. **RESULTS:** The median number of days in preparation was 1 (Mode=0; Mean=4). A third (34%) chose a same-day quit day, 41% chose a date 1-7 days post-enrollment, and 25% chose a date 8-14 days post-enrollment. The number of days in preparation was significantly lower among users with high intention (Incidence rate ratio (IRR)=.66) and self-efficacy (IRR=.65) and was significantly higher among daily smokers (IRR=1.39) and users who were often around other smokers (IRR=1.24). Most users (84%) made it to their quit day; 16% opted out before reaching their quit day. Being around other smokers (Odds ratio (OR)=.69) and high intention (OR=2.27) were significantly associated with making it to the quit day. **CONCLUSION:** Smokers with high intention and self-efficacy elected for a shorter preparation period. Smokers who were often around other smokers chose a longer preparation period and were less likely to make it to their quit day. Preparation messages that build intention and self-efficacy, while providing tips to reduce the effect of social influences, may foster retention.

FUNDING: Unfunded

PS4-173

EXAMINING THE ASSOCIATION BETWEEN PRESENCE OF A SMOKER IN THE HOME AND CHILD FOOD INSECURITY

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Significance: Across the United States in 2017, 17% of children under the age of 18 lived in a household that had experienced food insecurity in the past year. The association between tobacco use and food insecurity among adults and at the household level has been documented previously, though no study to date has explored the association between adult smoking and child food insecurity longitudinally. We sought to evaluate whether presence of a smoker at home is associated with later food insecurity among adolescents. **Methods:** We conducted a secondary analysis of data from a randomized controlled trial of school wellness policies conducted at 12 kindergarten through eighth grade schools in New Haven, Connecticut. Adolescents who completed baseline (grade 5) and follow-up (grade 7) assessments were included in these analyses (n=441). We used logistic regression to evaluate the association between self-reported presence of a smoker at home at baseline and food security at follow-up. The model was adjusted for potential confounding factors including gender, race/ethnicity, household size, and perceived neighborhood safety as a proxy for social class, as well as the randomized



study condition. **Results:** More than one-fifth of adolescents reported a smoker present at home during grade 5 (22.9%); 29.6% reported experiencing food insecurity at grade 7. Adolescents living in a household with a smoker were more than two times as likely to report food insecurity (adjusted odds ratio=2.16, 95% confidence interval: 1.30, 3.61). **Conclusion:** This study is among the first to explore a longitudinal association between presence of a smoker at home and child food insecurity. Our results highlight a potentially important opportunity to interrupt this pathway, wherein time-tested interventions may be efficiently targeted towards households with smokers to prevent child food insecurity.

FUNDING: Unfunded; Federal

PS4-174

E-CIGARETTE RESEARCH AT THE NIH (2016-2018)

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SIGNIFICANCE: We examine funded e-cigarette research at the NIH from 2016 to 2018. This includes research funded by the NIH Institutes and the FDA Center for Tobacco Products (CTP). Assessing the scope of grants studying new and emerging tobacco products is needed to determine coverage of scientific domains and the potential for research to provide a comprehensive understanding of the products' impact on public health. **METHODS:** Using an internal NIH database, we identified grants funded in fiscal years 2016-2018 focusing on e-cigarettes. Search terms included electronic cigarettes, electronic nicotine delivery systems, e-cigarettes and e-cigs combined with or. **RESULTS:** From 2016-2018, we identified 148 e-cigarette projects from 127 grants. Of these projects, FDA CTP funded 46.6%. The remaining projects were funded by NIH Institutes. New e-cigarette research investment remained steady in 2016 and 2017 at about \$11 million per year. Funding in 2018 increased to \$50 million due to funding of the Tobacco Centers of Regulatory Research. About half of all projects included research on knowledge, attitudes and behaviors (KAB) related to e-cigarette use (n=75). Research on health consequences (n=59) and toxicity (n=54) were the next most prevalent scientific domains studied. Chemistry/engineering was the least prevalent (n=15). Mechanistic research was found in 26 projects in studies on health consequences or toxicity of products. Eleven projects focused on policy research which fall outside CTP's regulatory authorities and can only be funded through NIH Institutes. **CONCLUSION:** Increased investment in e-cigarette research is expected given the growth of products and the urgent need to better understand these devices effect on public health. Our analysis indicates overlapping research areas between NIH- and CTP-funded grants such as KAB and addiction. However, there are scientific domains more in-line with agency mission, such as chemistry/engineering of e-cigarettes, or mechanistic research. Our analysis demonstrates how NIH- and CTP-funded e-cigarette portfolios are complementary and aims to better understand the impact of these new tobacco products on public health.

FUNDING: Federal

PS4-175

CHANGES IN "SMOKER" AND "VAPER" IDENTITIES OVER 12 MONTHS IN DUAL USERS AND ASSOCIATIONS WITH CHANGES IN BEHAVIOR

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Significance: Research suggests that "smoker" identity predicts the development, escalation, and cessation of cigarette smoking. Yet scant research to date has examined the presence of a "vaper" identity or the presence of dual identities among individuals who both smoke cigarettes and use ENDS. This study examined the presence of dual "smoker" and "vaper" identities among dual users of cigarettes and ENDS and how these changed over time with changes in use of both products. **Methods:** Data come from the baseline and 12-month questionnaires of 335 smokers (39% female, 47% White, mean age 35) who also use ENDS participating in a longitudinal observational study. Participants endorsed smoker identity ("smoker"; "social or occasional" smoker; "nonsmoker") and vaper identity ("vaper"; "social or occasional" vaper; "nonvaper") at both time points, reported product use, and completed measures of nicotine dependence (NDSS, FTND, WISDM). **Results:** At baseline, 72.5% of participants described themselves as "smokers" and of these; 22.9% were "vapers"; 54.5% were "social vapers" and 22.5% were "nonvapers". Of the 26.6% who self-described as "social smokers", 31.5% were also vapers; 52.8% were also social vapers; and 15.7% were nonvapers. At 12 months, there were significant changes in both smoking and vaping identities: overall, 56.1% were smokers; 26.9% social smokers; and 17% nonsmokers. Of the nonsmokers, 47.4% had vaper identities; 22.8% were social vapers; and 29.8% were

nonvapers. The smoker identity was the most stable over time (72% stayed same). Vaper identities, however, were substantially more fluid over time. Individuals who endorsed being a "vaper" at baseline were significantly more likely to be a nonsmoker at 12 months than those who endorsed other identities. Both smoking and vaping identities were significantly related to levels of use of both products in expected ways (stronger identities were significantly associated with more use and with higher levels of dependence). **Conclusions:** Dual users have both smoking and vaping identities which independently are related to changes in behavior over time. Assessment of identity may provide an opportunity for intervention to reduce smoking.

FUNDING: Federal

PS4-176

RELIGIOSITY, GENDER AND ADOLESCENT INTENTION TO USE TOBACCO IN INDIA

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SIGNIFICANCE. Religiosity measured as frequency of church attendance is inversely associated with intention to smoke cigarettes in U.S. adolescents but effect of religiosity measured as frequency of religious prayer on future smoking and smokeless tobacco use in the U.S. or other countries is unknown. Adolescent intention to smoke is known to predict future smoking. **SAMPLE.** Mumbai and Kolkata adolescents (n=1,982) ages 12-14 were interviewed in their homes (mean age=12.95 years, 50.0% male, grades 7-9). **METHODS.** Population-based in-home survey. Outcome measures were "At any time during the next 12 months, do you think you will [chew or apply / smoke] tobacco?" Answer options were: Definitely not, Probably not, Probably yes, Definitely yes. The religiosity measure was "How often do you pray?" Answer options were: Never, 1-3 times/year, 1-3 times/month, 1-3 times/week, Nearly every day. Results were stratified by religious affiliation: Hindu (n=1,353), Muslim (n=543), Other (n=85). Covariates included age, gender and academic performance. **RESULTS.** Most adolescents said "Definitely not" (93.6%-smokeless; 92.7%-smoking) when asked if they would use tobacco in the next 12 months, so the tobacco use intention measures were dichotomized. Most adolescents (75.6%) prayed at least weekly. Tobacco use intention was inversely associated with frequency of prayer (smokeless-p = .008; smoking-p = .001). Stratifying by religious affiliation, daily prayer was associated with the highest proportion saying "Definitely not" to tobacco use intention (91.4% to 93.6%) across religious categories (smokeless-p = .008; smoking-p = .015). Hindu respondents who prayed nearly every day were more likely (93.6%) to say "Definitely not" compared to those who never prayed (82.5%) (smokeless-p = .016; smoking p = .025). By contrast, Muslim respondents were more uniformly definitely not intending to use tobacco (88.4% to 93.3%), regardless of how often they prayed (smokeless-p = .888; smoking-p = .707). In all analyses, girls were more likely than boys to say that they definitely would not use tobacco in the next 12 months (girls = 96.0%; boys = 89.4%; p = .001) perhaps, in part, because more girls (79.4%) than boys (71.7%) prayed at least weekly (p = .001). **CONCLUSIONS.** Adolescents who pray at least weekly have minimal risk of future tobacco use, regardless of religious affiliation. Adolescent religiosity and female gender may be protective factors against tobacco use onset in India.

FUNDING: Federal

PS4-177

CIGARETTE SMOKING AMONG HIV-INFECTED ADULTS WITH COMORBID MEDICAL CONDITIONS IN A LARGE HIV COHORT (2011-2017) IN WASHINGTON, D.C.

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Significance: People with HIV (PWH) who smoke cigarettes and are also coping with concurrent medical comorbidities may have unique challenges in cessation. Understanding the prevalence of smoking, and correlates of medical comorbidities among PWH who smoke, are needed to inform targeted cessation strategies for this vulnerable



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group. **Methods:** The DC Cohort Longitudinal HIV Study is a large observational cohort study initiated in 2011 of PWH in Washington, D.C. In a cross-sectional analysis of baseline enrollment data (2011-2017) of the DC Cohort ($n = 7,228$), we assessed the prevalence of cigarette smoking among adults (≥ 18 years) with medical comorbidities (cardiovascular, cancer, pulmonary, and psychiatric diagnoses). Relative risk of having a medical comorbidity among PWH who smoke was estimated using Poisson regression with robust standard error estimates. **Results:** At baseline, 3,027 (42%) PWH were current and 1,359 (33%) former cigarette smokers. Overall, 3,960 (55%) did not have a comorbidity, 2,784 (39%) had one comorbidity, and 416 (6%) were multi-morbid (≥ 2 comorbidities). We found 216 (3%) adults with cardiovascular, 503 (7%) cancer, 160 (2%) pulmonary, and 2,759 (39%) mental health comorbidities. Smoking prevalence was 36%, 50%, 51%, and 64% among those with none, one, two, and three comorbidities, respectively. In adjusted analysis of smokers, 50-59 and 60+ years age categories (RR 1.11; 95% CI: 1.07, 1.15 and RR 1.16; 95% CI: 1.11, 1.21, respectively), public/no health insurance (RR 1.09; 95% CI: 1.05, 1.14), and temporary/homeless housing status (95% CI: 1.07; 95% CI: 1.04, 1.11) were positively associated with having a comorbidity. Being Black (95% CI: 0.91; 95% CI: 0.87, 0.96) and male (RR 0.94; 95% CI: 0.92, 0.98) were negatively associated with having a comorbidity. CD4+ count, viral load, and having an AIDS diagnosis were not associated with having a comorbidity. **Conclusions:** PWH with a concurrent medical comorbidity have a higher prevalence of smoking than those without. Age, socioeconomic status, gender, and racial subgroup, but not HIV clinical indicators, are associated with concurrent comorbid conditions among PWH.

FUNDING: Federal

PS4-178

PREDICTING ELECTRONIC NICOTINE DELIVERY SYSTEM USE THROUGH INFORMATION SEEKING, CIGARETTE SMOKING, AND ADDICTIVE AND HARMFUL BELIEFS AMONG U.S. ADULTS

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Significance: Electronic nicotine delivery systems (ENDS) are gaining in popularity as ostensibly less harmful alternatives to combustible tobacco products. It is not entirely clear, however, what factors predict ENDS use. The purpose of this study was to evaluate a number of predictors of ENDS use. **Method:** Data were drawn from two iterations of the Health Information National Trends Survey done in conjunction with the Food and Drug Administration (HINTS-FDA, 2015 and 2017). Controlling for survey year, logistic regression models were weighted to reflect the population and used to predict ENDS ever use from ENDS information seeking, tobacco cigarette ever use, the perceived addictive nature of ENDS, and the perceived harm associated with ENDS use. **Results:** ENDS ever use from the pooled sample of 5,474 respondents was predicted by two of our models. First, by our model including sociodemographic characteristics ($p < 0.001$, $R^2 = 16\%$), and second, by our model including sociodemographic characteristics in addition to information-seeking, tobacco cigarette ever use, the perceived addictive nature of ENDS, and the perceived harms associated with ENDS use ($p < 0.001$, $R^2 = 23.2\%$). Significant predictors included information-seeking (OR = 0.49 [0.26, 0.91]) and the perceived addictive nature of ENDS (OR = 0.41 [0.18, 0.90]), both of which were associated with a decreased likelihood of ENDS use. **Conclusion:** The outcomes described two significant models of adults use of ENDS in the U.S. The findings extended the current knowledge of different factors that escalate the use of ENDS among adults. This will support the efforts of policymakers and public health professionals to regulate ENDS understand its consumer behaviors.

PS4-179

AGE OF TWITTER USERS WHO INTERACT WITH E-CIGARETTE MANUFACTURERS

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Significance: E-cigarette use is increasingly common among teenagers. Many studies have sought to understand the causes of this trend - especially the role of e-cigarette marketing on social media. However, nearly all existing studies have a common limitation: They do not quantify what proportion of social media users who interact with e-cigarette advertisers are teenagers. This is likely because users' ages is not publicly available on the social media platforms that are most popular with teenagers, such as Twitter and Instagram. This study employs a machine-learning algorithm to deduce the age of Twitter users who interact e-cigarette vendors on Twitter. **Methods:** A list of 69,074 Twitter users who follow the Twitter accounts of five major e-cigarette companies was assembled. These users' ages were deduced using a machine learning algorithm described by Wang *et al.* (Demographic Inference and Representative Population

Estimates from Multilingual Social Media Data, 2019), which infers ages from data such as names, Twitter handles, and profile pictures. The false positive rate (FPR) and false negative rate (FNR) of this algorithm were calculated empirically by running the algorithm on 3,080 Twitter users with known ages, where "positives" were defined as users aged 18 or younger. These error rates were used to parameterize a maximum likelihood estimator for a Bernoulli distribution. 95% confidence intervals for the proportion of users of age 18 or less were calculated from this distribution via the Agresti-Coull method. **Results:** The machine-learning algorithm had an FPR of 17.82% and FNR of 8.18%. Of users following e-cigarette Twitter accounts, 2.03% (95% CI: 0.14% - 3.91%) were 18 or younger. Of a random sampling of Twitter users, 18.65% (95% CI: 16.43% - 20.87%) were 18 or younger. **Conclusion:** Although prior research cites Twitter as a vector for encouraging e-cigarette use in teenagers, this analysis finds that relatively few teenagers follow Twitter accounts of major e-cigarette vendors. Further research is needed to understand the causes of this discrepancy. This has ramifications for those who wish to design interventions to prevent youth e-cigarette use.

FUNDING: Unfunded

PS4-180

EXPOSURE TO MANGANESE AND OTHER METALS IN ELECTRONIC NICOTINE DELIVERY SYSTEM (ENDS) USERS IN THE PATH STUDY 2013-2014

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Significance: Evaluating safety of ENDS requires comprehensive measures of toxic chemicals. ENDS are highly engineered products containing and emitting metals. Few studies, however, have evaluated the potential of ENDS as a source of toxic metal exposure. This study evaluated metal body burden by ENDS use status. **Method:** We used the Population Assessment of Tobacco and Health (PATH) Study Wave 1 data from 11,487 adults to compare urinary metal concentrations of Beryllium (Be), Cadmium (Cd), Cobalt (Co), Manganese (Mn), Lead (Pb), Strontium (Sr), Thallium (Tl), and Uranium (Ur) between (1) Poly tobacco users including ENDS (cigarette+ENDS and at least one other tobacco product), (2) Poly tobacco users without ENDS (cigarette and at least one other tobacco product), (3) ENDS only users, and (4) Nonusers. We used weighted linear regression models on log-transformed urinary metal concentrations by tobacco use status adjusting for sex, age, race, region, secondhand smoke exposure at home and work, and hours in past 7 days in close contact with smokers. **Results:** Among participants who had urine metal data, 3.3% were poly users with ENDS, 38.2% were poly users without ENDS, 1.7% were ENDS only users, and 56.8% were non-users. The adjusted geometric mean ratio (GMR) for urinary Mn comparing poly users including ENDS, poly users without ENDS, and ENDS only users to non-users were 1.34 (95% Confidence Interval: 1.04, 1.74), 1.02 (0.89, 1.15), and 1.77 (0.51, 6.20), respectively. There were no statistically significant differences for other metals by ENDS use status. **Conclusion:** These data from the PATH study suggest that ENDS, both alone and in polyeuse, are contributing to the body burden of manganese, a potent neurotoxicant previously identified in ENDS liquid and aerosol samples. Other urinary metals available in PATH were not associated with ENDS use status. Studies are needed that assess other metals commonly found in ENDS emissions such as nickel and chromium, currently not measured in PATH.

FUNDING: Federal

PS4-182

LIFETIME ELECTRONIC CIGARETTE USE IS ASSOCIATED WITH INCREASED RISK OF CURRENT CANNABIS USE AMONG MARYLAND HIGH SCHOOL STUDENTS

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Aim: The dramatic increase in e-cigarette use is an emergent and critical public health concern that has been declared an "epidemic" by the Surgeon General and FDA. There is growing concern that e-cigarette use may be a risk factor for initiation of cannabis use, either smoked or vaporized, which is increasing among young people. We examined whether lifetime e-cigarette use was associated with current cannabis use among a representative sample of Maryland Highschool students. **Methods:** Data came from the 2016 Maryland Youth Risk Behavior Survey (MD YRBS) a representative sample of 21,517 high school students in the state. MD YRBS is a school-based survey conducted by the Maryland Department of Health, in conjunction with CDC's YRBS program and



the 2016 data collection had a response rate of >60%. We used logistic regression to investigate predictors of current (past 30-day) cannabis use. Analyses controlled for sociodemographics and included weights to compute population-representative estimates. **Results:** Current cannabis use was reported by 18.4% of students. Lifetime e-cigarette use was reported by 35.3%, while 15.3% reported lifetime combustible cigarette use. Lifetime e-cigarette use was associated with an increased risk of current cannabis use (Odds ratio = 1.79, 95% confidence interval 1.71-1.87), while controlling for lifetime cigarette use (OR = 1.28, 95% CI 1.19-1.38) and sociodemographics (age, gender, race/ethnicity). **Conclusion:** E-cigarette use may be a risk factors for cannabis use among high school students over and above combustible cigarette use. These findings confirm those of existing cross-sectional and longitudinal studies. Future research on e-cigarette use patterns and trajectories are needed as are effective and scalable prevention and cessation strategies.

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PS4-183

RECIPROCAL ASSOCIATIONS BETWEEN MATERNAL SMOKING CESSATION AND BREASTFEEDING

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Significance: Previous research supports the potential of reciprocal associations between maternal smoking and insufficient breastfeeding. We aimed to identify 1) the influences of smoking cessation on breastfeeding knowledge, intent, initiation, and duration among smoking mothers, and 2) the impacts of breastfeeding on postpartum smoking relapse among quitters. **Methods:** Within the UB Pregnancy and Smoking Cessation Study (2015-2019), we analyzed smoking and breastfeeding-related data of 32 daily smoking pregnant women in Buffalo, NY, USA. Smoking abstinence was confirmed by breath carbon monoxide (4 ppm or lower) and urine cotinine (below 100 ng/mL) tests. Smoking relapse was defined as returning to smoking 1 or more cigarettes daily for at least 7 consecutive days. We used questionnaires to measure breastfeeding knowledge and intent before and after smoking cessation intervention; and breastfeeding initiation and duration through monthly surveys up 24 postpartum months. Paired *t*-test, Fisher's exact test, and Kaplan Meier Survival Curve were used to compare breastfeeding knowledge, intent/initiation, and duration between quitters and non-quitters, respectively. Fisher's exact test was used to compare smoking relapse rates by breastfeeding status in earlier months. **Results:** For both quitters (score 1.7 vs 2.0) and non-quitters (score 0.6 vs 1.5), breastfeeding knowledge moderately increased from pre-test to post-test. The percentage of women with exclusive breastfeeding intent increased significantly (31.6% vs 47.4%) among quitters but remained relatively stable among non-quitters (14.3% vs 16.7%). Quitters had much higher breastfeeding initiation rate (73.7% vs 23.1%; $p=0.011$) than non-quitters. Non-quitters weaned their babies much earlier than quitters (Kaplan Meier $p<0.001$). On the other hand, only 28.6% of breastfeeding mothers at 1 month postpartum relapsed to smoking at 3 months, compared to 75.0% of non-breastfeeding mothers relapsed. Similarly, only 33.3% of breastfeeding mothers at 3 months postpartum relapsed to smoking at 12 months, compared to 73.7% of non-breastfeeding mothers relapsed. **Conclusion:** Smoking cessation increased breastfeeding intent, initiation, and duration, while breastfeeding might reduce risk of postpartum smoking relapse. An integrated intervention of maternal smoking cessation and breastfeeding promotion is promising to enhance both long-term smoking abstinence and sufficient breastfeeding.

FUNDING: Unfunded; Federal; Academic Institution

PS4-184

INFLUENCE OF DAILY TOBACCO, ALCOHOL, AND MARIJUANA USE ON ODDS AND QUANTITY OF SAME-DAY CO-USE AND TRI-USE

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Young adults engage in complex patterns of tobacco, alcohol, and marijuana co-use and tri-use. Although research has started investigating the effects of same-day use of these substances on one another, evidence for behavioral antecedents remains limited. This study aimed to examine the influence of day-level tobacco, alcohol, and marijuana use on the use of the other two substances, as well as their influence on day-level heaviness of use. College students (N=341) reporting past-month simultaneous alcohol and marijuana use completed two 28-day bursts of data collection, responding to multiple daily surveys on substance use and context. Any tobacco, alcohol, or marijuana use was associated with increased odds of same-day tri-use (versus all other use patterns)

in a series of three generalized linear mixed-effects models. Separately, mixed-effects negative binomial hurdle models found that increased number of day-level marijuana use occasions and any day-level tobacco use were associated with increased likelihood of any alcohol use [Model 1; binomial] and increased number of drinks [Model 1; count]. A significant interaction between these effects found that any tobacco use attenuated the relationship between number of marijuana use occasions and likelihood of any alcohol use [Model 1; binomial]. Similarly, day-level number of drinks and any day-level tobacco use were associated with increased likelihood of any marijuana use [Model 2; binomial] and number of drinks was associated with increased number of marijuana use occasions [Model 2; count]. Significant interactions between these effects found that any tobacco use attenuated the relationship between number of drinks and likelihood of any marijuana use [Model 2; binomial] but strengthened the relationship with number of marijuana use occasions [Model 2; count]. Using tobacco, alcohol, or marijuana increases the likelihood of using one or both other substances during the same day, and of heavier use of alcohol and marijuana. Characterizing complex poly-substance use patterns is an essential step towards intervening on these behaviors during situations of greatest potential risk.

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PS4-185

DO HEALTH CONDITIONS AND CONCERNS ABOUT HEALTH EFFECTS OF SMOKING PREDICT SUBSEQUENT QUITTING ACTIVITIES

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Significance: Limited research has systematically investigated the relationship between multiple health conditions and subsequent quitting activities at the population level. This study examines whether nine health conditions (individually or combined) and concerns related to smoking are predictive of subsequent quit attempts and quit success. **Methods:** Data came from the International Tobacco Control Four Country Smoking and Vaping Survey conducted in the US, Canada, England and Australia. A total of 4,753 smokers (at least monthly) were surveyed in 2016 and recontacted in 2018. Respondents were asked in 2016 whether they had a medical diagnosis for depression, anxiety, alcohol problems, severe obesity, chronic pain, diabetes, heart disease, cancer and chronic lung disease, and whether they had concerns about past and future health effects of smoking. Logistic regression was used to examine the association between these attributes and subsequent quit attempts and quit success, adjusting for socio-demographics, dependence, intention and self-efficacy to quit. **Results:** 47.5% of the sample reported having made at least one quit attempt between the two survey waves. Of these, 27.1% were still not smoking in 2018. Concerns about past (adjusted OR, AOR=1.39, 95% CI 1.02-1.92, $p<0.05$) and future health effects (AOR=2.10, 95% CI 1.40-3.14, $p<0.001$) were found to be predictive of making quit attempts. Only chronic pain was predictive of reduced likelihood of staying quit (i.e., quit success) among those who made attempts (adjusted OR=0.41, 95% CI 0.26-0.65, $p<0.001$). **Conclusion:** Overall, concerns about health effects predict subsequent quit attempts, but not staying quit. Reporting specific health conditions does not add to prediction of quit attempts. The only independent predictor of quit success is chronic pain, which is negatively related to staying quit in the medium term among those who made attempts.

FUNDING: Federal; Academic Institution

PS4-186

STATE-SPECIFIC ESTIMATES OF RECEIPT OF CESSATION COUNSELING FROM DENTIST AND PHYSICIAN OFFICES

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Significance: Smoking contributes to diminished oral and overall health. Professional cessation counseling can help minimize health risks current smokers face. We assessed national and state-specific prevalence of receipt of cessation counseling by Dentists and Physicians among current smokers. **Methods:** Self-reported, pooled-data, from 2010-2011 and 2014-2015 TUS-CPS were analyzed for participants reporting receipt of advice and/or cessation assistance from a Dentist or Physician. Sociodemographic characteristics of each state were reported. The percentage of current adult smokers by



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tobacco use type were calculated nationally and further stratified by state. Prevalence estimates of advice and assistance given were assessed by provider. Data were weighted to yield representative estimates and differences were examined with chi-squared tests ($p < 0.05$). **Results:** Overall, 1.6% of US adults currently use of smokeless tobacco, 17.2% currently use of combustible tobacco, and 18.4% currently use of any tobacco product. State-specific prevalence of smokeless tobacco use among adults ranged from 0.5% (New York, California, and Delaware) to 7.2% (Wyoming). Prevalence of adults who use combustible tobacco ranged from 11.2% (Utah) to 26.5% (Kentucky). Moreover, among adults in all states and the District of Columbia, any tobacco product use was least prevalent in California (11.7%) and most in Kentucky (28.6%). Physicians (64.8%) provide currently smoking patients cessation advice twice the rate of Dentist (31.2%). Furthermore, current-smoking, adults, who visited a Physician and/or Dentist in the past year, reported that only 33.8% of Physicians and 7.6% of Dentist provided them with assistive services for smoking cessation. **Conclusions:** Currently smoking adults are not being advised by Dentist to quit smoking as compared to Physicians. Additional training on smoking intervention and implementation in dental settings could increase Dentists' involvement in cessation counseling and encourage Dentists to provide preventative care to their currently smoking patients.

PS4-187

ORAL SELF EXAMINATION TO PROMOTE EARLY DETECTION OF ORAL PRE CANCERS AND CANCERS

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Significance: India has one of the largest numbers of tobacco consumers and resulting disorders. Tobacco use in India differs from the international use pattern. Widespread use of various types of smokeless tobacco preparations, ingrained cultural attributes and socio-cultural diversity within the country are the main reasons for this diversity. Availability of and access to existing cessation services are also limited for the population. This becomes particularly challenging for lower socio economic sections are often heavily addicted to tobacco use and develop resulting oral pre-cancers and cancers. The lack of education and awareness in this population subset compounds the problem by detection in late stages. Keeping this in view on site tobacco cessation counseling and interventions were developed along with self mouth examination technique education. **Aim:** To study the effectiveness of oral self examination techniques in promote early detection of oral pre-cancers and cancers. **Methods:** Three onsite tobacco cessation sessions were conducted in 2018. The participants in the session mainly constituted of tobacco users. Individuals with interest in education about harmful effects of tobacco or with tobacco user relatives also participated. Information about different types of harmful tobacco preparations, self examination techniques, types of disorders emerging from tobacco use and cessation methods were provided to the participants in these sessions. A total of 92 participants attended all three sessions. The intention was to promote oral self examination along the lines of breast self examination to help tobacco users in identifying mucosal changes resulting from tobacco use. Oral cancer is often detected in the late stages which results in poor prognosis. Most of the cases of tobacco related oral conditions present with pre malignant / precancerous changes. General population is often unaware of precancerous mucosal alterations and education about self examination and oral pre cancer identification will help in early detection and significant reduction of morbidity and mortality. **Results:** 28 tobacco users were able to identify oral precancers by using self examination techniques. 14 tobacco users requested for habit cessation guidance. Additional 37 participants requested detailed information about various sections elaborated in these sessions. **Conclusion:** Oral self examination can be promoted along the lines of breast self examination to promote early detection of oral pre cancers and cancers.

PS4-188

PATTERNS OF BIRTH COHORT-SPECIFIC SMOKING HISTORIES BY RACE AND ETHNICITY IN THE US, 1965-2017

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Background: Smoking prevalence varies greatly by race and ethnicity in the US. However, little is known about how smoking initiation and cessation rates vary by birth cohort across different sociodemographic groups. Detailed data about smoking behaviors can be used to study and address tobacco use disparities. **Methods:** Cross-sectional data from the National Health Interview Survey 1965-2017 were used to construct smoking histories for U.S. adults by race, Hispanic origin, sex, and birth cohort. Age-period-cohort models with constrained natural splines were developed to estimate smoking initiation, cessation, intensity and prevalence by age, birth cohort

(1890-1990), sex, and race/ethnicity prevalence. Separate estimates for non-Hispanic Whites (NHW), non-Hispanic Blacks (NHB), Hispanics, non-Hispanic American Indians and Alaskan Natives (AIAN), and non-Hispanic Asians and Pacific Islanders (API) were obtained. **Results:** Age-specific probabilities of smoking initiation were highest among AIAN, second highest among NHW and lowest among API and Hispanics. For earlier birth cohorts, initiation probabilities among NHB were comparable to that of NHW, but have decreased more rapidly and are lower for recent birth cohorts. Across most birth cohorts and ages, cessation probabilities were lowest among AIAN and NHB, and highest among NHW and API. Taken together, the initiation and cessation patterns explain observed features of smoking prevalence by race/ethnicity, birth cohort and age; e.g., the highest smoking prevalence among AIANs across all ages and birth cohort, or the lower prevalence of smoking in NHB vs NHW at younger ages but the higher rates in NHB at older ages. **Conclusions:** This study provides in-depth historical smoking behaviors by race/ethnicity in the US, identifying important differences in cohort- and age-specific initiation and cessation rates. These patterns by race/ethnicity, including changing behaviors across birth cohorts, need to be taken into account when planning tobacco control interventions to reduce smoking disparities. The AIAN population continues to have the highest smoking rates and lowest cessation rates of all racial/ethnic groups.

FUNDING: Federal

PS4-189

PROFILE AND PATTERNS OF DUAL USERS OF E-CIGARETTES AND CIGARETTES AMONG MEXICAN ADULTS

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Significance: Dual use of e-cigarettes and cigarettes is increasing worldwide, and is the dominant pattern of e-cigarette use in Mexico, where 78% of e-cigarette users also smoke (vs. 55% in the US). This study assessed differences between dual users and exclusive smokers, as well as the correlates of more frequent e-cigarette use among dual users. **Methods:** An online survey of Mexican adult smokers and vapers recruited from a marketing research panel provided data from dual users (n=846) and exclusive smokers (n=1,615). Adjusted logistic models regressed dual use (0=exclusive smokers and 1=dual users) on sociodemographics, smoking dependence; quit intentions; any quit attempt in the last four months; preference for cigarettes with flavor capsules; last month marijuana use; last month binge drinking; and smoking and vaping among family and friends. Also, among dual users a censored binomial model was estimated, regressing e-cigarette use frequency on the same variables as above, as well as e-cigarette dependence, preferred e-cigarette device type, favorite e-juice flavor and, where they obtained their device. **Results:** Compared to exclusive smokers, dual users were younger, had higher education (AOR=2.13, CI 95% 1.72-2.65) and income (AOR=2.06, CI 95% 1.52-2.79), had higher smoking dependence (AOR=1.29, CI 95% 1.16-1.43), were more likely to prefer cigarettes with flavor capsules (AOR=1.39, CI 95% 1.13-1.98), to have recently tried to quit (AOR=1.31, CI 95% 1.05-1.71), and had friends (AOR=3.73, CI 95% 1.05-1.71) and family (AOR=2.98, CI 95% 1.05-1.71) who both smoked and used e-cigarettes. Independent predictors of e-cigarette use frequency included more frequent smoking (Adjusted prevalence ratio (APR)=^{smoking six or more cigs daily vs. nondaily smoking} 1.65 CI 95% 1.41-1.94), having made a recent quit attempt (APR==1.14, CI 95% 1.01-1.30), higher e-cigarette dependence (APR==1.26, CI 95% 1.08-1.47), use of e-cigarettes with fruit flavor (vs. tobacco flavor) (APR==1.24, CI 95% 1.07-1.44), and marijuana use (APR==1.17, CI 95% 1.01-1.36). **Conclusion:** In Mexico, e-cigarettes appear to appeal to a distinct, higher socioeconomic segment of smokers who are more addicted to smoking. Both dual use and e-cigarette use frequency were higher among those who recently attempted to quit, suggesting potential replacement of cigarettes with e-cigarettes. Research is needed to better evaluate trajectories of use and strategies to promote switching and cessation of both products in low- and middle-income countries like Mexico.

FUNDING: Federal

PS4-190

IT'S WEIRD, BUT IT'S SO DELICIOUS, AND THAT'S THE PROBLEM. THE ROLE OF FLAVORED TOBACCO PRODUCTS IN TOBACCO USE TRANSITIONS AMONG YOUNG ADULTS

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Significance: Flavored tobacco products, including sweet and fruity e-cigarettes, have garnered substantial attention because of their influence on tobacco initiation and nicotine addiction among adolescents. The role of flavors in *young adult* tobacco use is less studied, although significant tobacco transitions occur during young adulthood. A rich understanding of how and why young adults use flavored tobacco products is needed to assess the net public health impact of flavored tobacco and to guide its future regulation.

Methods: This analysis is based on qualitative data associated with a longitudinal study of current users of two or more of the following (cigarettes, e-cigarettes, smokeless tobacco) and age 18-29 residing in California at baseline (n=50). Our analysis explored whether and how flavors are involved in product use transitions, informed by the social and policy context in which young adults live. We conducted semi-structured interviews and conducted iterative readings of verbatim transcripts to develop a codebook and to distill findings post-coding. **Results:** We identified 6 primary themes associated with how flavors influence product transitions. For example, selecting a flavor was commonly described as a key feature of e-cigarette initiation. Cigarette smokers often applied knowledge about their cigarette taste preferences to their e-cigarette flavor choices. Furthermore, some individuals manipulated flavor in hopes of reducing or ending use (of cigarettes and e-cigarettes). Availability of flavored product options influenced both revealed preferences and product initiation. For example, both vape shops and social networks facilitated the choice of e-cigarette flavor by allowing curious young adults to try multiple flavors, receive advice, and be guided in decisions about product preferences. **Conclusion:** Characterizing flavors are involved in product use transitions among experienced young adult tobacco users and not just new, youth experimenters. As such, restrictions on the sale of flavored tobacco products will impact young adult e-cigarette initiation and transition that may influence their cigarette smoking.

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PS4-191

USE OF SLIM CIGARETTES AMONG CHINESE URBAN POPULATION IN 2018-2019

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SIGNIFICANCE: Sales of slim cigarettes in China has increased more than 100 times in the past decade. The volume of consumption far exceeds what would be expected if users of such cigarettes were only women, which was supposedly the target group when these cigarettes were first introduced. This study aims to examine the characteristics of those who use slim cigarettes in the Chinese urban population. **METHODS:** An online panel of 20,055 adults from 19 major cities in China were surveyed from October 2018 to April 2019. The online panel is relatively young, with the mean age of 32.2 years (SD=9.0). **RESULTS:** Overall, 12.0% currently smoked slim cigarettes, with 2.7% smoking slim cigarettes exclusively and 9.3% smoking both regular and slim cigarettes. This comprises 37.7% of all current smokers. The proportion of slim cigarette users among current smokers was significantly higher among females than among males (52.9% vs. 34.2%), and significantly higher among those who had a bachelor degree than those who did not (41.3% vs. 33.1%). Most slim cigarette users started from smoking regular cigarettes (85.1%). The most popular reasons for using slim cigarettes included: slim cigarettes are "less harmful" (32.2%), "look good" (28.5%) and "taste good" (21.1%). Among current smokers, slim cigarette users had a higher rate of attempting to quit smoking in the last 12 months than non-slim users (48.6% vs 40.8%, AOR=1.33 [95% CI=1.20-1.48]). **CONCLUSION:** A high proportion of current smokers in an online panel population from 19 cities in China smoked slim cigarettes. Slim cigarettes were more likely to be used by the educated and female smokers. However, many male smokers also used slim cigarettes. It appears that some smokers shifted to slim cigarettes because they believed slim cigarettes are less harmful. It is not clear if slim cigarettes will repeat the history of "light cigarettes" in the U.S. where smokers wrongly believed that light cigarettes are less harmful. The potential impact of increasing use of slim cigarettes in China should be evaluated.

FUNDING: Federal; Academic Institution

PS4-192

FLAVORED E-CIGARETTE USE AND SMOKING AND QUITTING BEHAVIOR OVER TIME: A NATIONAL STUDY AMONG YOUNG ADULT ESTABLISHED SMOKERS

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Significance: Use of e-cigarettes (e-cigs) has increased among young adult cigarette smokers in recent years. These smokers are also most likely to use e-cig flavors such as

menthol and sweet flavors. There is little data on the role of e-cig flavors in smoking and cessation behaviors among young adult smokers. This study examined the use of e-cig flavors on smoking-related outcomes among young adult established smokers over time. **Methods:** Longitudinal data from the PATH study from young adult (age 18-34) established cigarette smokers at wave 1 with data at waves 1-3 were used (n=2,722). Adjusted multinomial regressions examined associations between past year quitting and smoking reduction at wave 3 among wave 1 established smokers as a function of e-cig flavor use, controlling for sociodemographics, tobacco-related variables and prior e-cigarette use. **Results:** At wave 3, 11.8% of respondents quit smoking, 9.7% reduced amount smoked, 78% did not use e-cigs, 2.2% used tobacco e-cigs only, 10.4% used e-cigs with a single non-tobacco flavor, and 9.4% used e-cigs with multiple non-tobacco flavors. Compared to continued smoking, quitting and reducing cigarettes smoked by wave 3 was more common among current e-cig users of 1 non-tobacco flavor (Quitting RRR=1.65, p=0.04; Reducing RRR=2.27, p=0.001 for reducing) or of multiple non-tobacco flavors (Quitting RRR=2.34, p=0.00; Reducing RRR=3.05, p=0.00) vs. no e-cig use. There were no differences in outcomes for use of tobacco e-cigs only vs. no e-cig use. There were no substantive differences in findings when models were stratified by younger and older young adults (18-24 and 25-34). **Conclusions:** While the appeal of flavored e-cigs for young non-tobacco users is a matter of critical importance, non-tobacco flavored e-cigs may also have a role in helping adult smokers quit, including young adult smokers. Research is needed to illuminate the potential role of e-cig flavors in cessation and continued smoking among established smokers.

FUNDING: Unfunded

PS4-193

ADVERSE CHILDHOOD EVENTS AND PHYSICAL ACTIVITY IN WOMEN WHO WANT TO QUIT SMOKING

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Significance: A high number (4+) of adverse childhood experiences (ACEs) is linked to high-risk adult health behaviors, such as smoking and substance abuse. These behaviors may serve as maladaptive coping mechanisms to manage mood and stress in adults with a history of ACEs. Physical activity is an effective alternative coping strategy for managing mood and stress and there is some evidence supporting its use in promoting smoking behavior change. However, it remains to be seen whether a history of ACEs may inhibit physical activity in women trying to quit smoking. **Methods:** We examined cross-sectional data (n=51) from baseline assessments collected as part of a larger ongoing smoking cessation trial among premenopausal women between 18-40 years of age. Analyses examined the associations between revised inventory of Adverse Childhood Experiences (R-ACE) scores and physical activity as measured by items from the International Physical Activity Questionnaire (IPAQ). High activity was defined as three or more days of vigorous physical activity or 5 or more days of moderate physical activity. A chi-square test was conducted to examine the relationship between a history of 4 or more (vs. 3 or fewer) ACEs and low vs. high physical activity scores. **Results:** Participants had a mean age of 33.2 (sd=4.9) and reported smoking an average of 14 cigarettes/day (sd=6.1). The mean R-ACE score was 5.6 [sd=3.8], with 69% of the sample reporting 4 or more ACEs. Sixty-five percent were classified as low-activity. Individuals with a history of 4 or more ACEs were less likely to report high activity levels than those with 3 or fewer ACEs (p=.08). **Conclusion:** These observations suggest that women who smoke and have high ACEs may be less likely to engage in physical activity. Additional research is needed to replicate our observations, explore the temporality of the relationship, and examine how this association may be used to promote smoking cessation efforts in women with a history of ACEs.

FUNDING: Federal

PS4-194

ENGAGING IN PHYSICAL ACTIVITY IS ASSOCIATED WITH FEWER CIGARETTES PER DAY AMONG FEMALES REPORTING SLEEP DISTURBANCES.

Uma Nair, Elizabeth Miller, Iva Skobic, Kristina Souders, Alicia Allen. University of AZ, Tucson, AZ, USA.

Introduction: Evidence points to the role of sleep disturbances and physical activity (PA) in smoking outcomes; however little is known on how engaging in PA may be associated with smoking among those reporting poor sleep. The purpose of this study was to examine associations between PA, cigarettes smoked per day (CPD), and sleep among females enrolled in a randomized smoking cessation trial. **Methods:** The



study analyzed baseline data from 18-40 year old females who were motivated to quit smoking. Number of days engaging in PA was assessed using the International Physical Activity Questionnaire (IPAQ). Sleep disturbance measured by the Insomnia Severity Index (ISI) was dichotomized at the median split (low vs. high; ISI). Cigarettes smoked per day (CPD) was assessed using the timeline follow back method. Results: Mean participant (n=56) age was 33.3 (SD=5.02) years, mean CPD reported was 13.8 (SD=6.0); participants reported an average ISI score of 10.5 (SD=7.0), and engaged in 2 days (SD=2.1) and 1.8 (SD=2.1) days of moderate intensity and vigorous intensity PA, respectively. After controlling for nicotine dependence and weight concerns, number of days engaging in moderate intensity physical activity was inversely correlated with fewer CPD ($r = -0.41$; $p = 0.04$) in the high ISI group (n=29), but not among those reporting fewer sleep disturbances ($r = 0.18$, $p = 0.20$; n=21). Similar associations were seen for vigorous intensity physical activity between the two groups. Conclusion: Engaging in moderate intensity physical activity may be linked to smoking fewer CPD among those with sleep disturbances. These observations suggest women with sleep disturbances may benefit from PA interventions; however, the association between CPD and PA needs to be explored over time and replicated in a larger sample.

FUNDING: Federal

PS4-195

ASSOCIATION OF PERCEIVED RISK OF E-CIGARETTE AND USERS' CHARACTERISTICS AMONG INDONESIAN ADULTS

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Significance: Use of e-cigarettes is increasing globally but assessment of users' perception of its health risk is lacking, especially among users in low- and middle-income countries such as Indonesia. This study aimed to assess perceived risk of e-cigarettes among adults in Indonesia, home to the third largest population of tobacco users in the world. **Methods:** Data are from an online national convenience sample of Indonesian e-cigarette users ages 18 or older (N=1,322). Respondents were recruited via targeted ads in Facebook and Instagram. Perceived risk was assessed by asking "how harmful are e-cigarettes to your health?" with response options ranging from 1 (not at all harmful) to 4 (extremely harmful) and dichotomized into "not harmful" vs "harmful". We also assessed vaping status (vaping only vs vaping and smoking dual use), social support (having at least one friend who vapes or not), and belief that e-cigarettes are affordable (i.e., agree, neutral, or disagree). Logistic regression estimated association of perceived risk of e-cigarette and users' characteristics (i.e., vaping status, social support, and perceived affordability), adjusted for demographics (sex, age group, educational level, and income). **Results:** About 55% of participants perceived e-cigarettes as not harmful. The majority were dual users (80%), have at least one friend who vapes (98%), and think that e-cigarettes are affordable (70%). We found that perceived risk was not associated with vaping status (OR=1.23; 95%CI=0.93-1.63) or social support (OR=2.47; 95%CI=0.86-7.13), but was negatively associated with perceived affordability (OR=0.62; 95%CI=0.47-0.81). Of the demographic variables, only level of education was associated with perceived risk, with people with higher education perceiving a higher level of risk (OR=1.33; 95%CI=1.05-1.69). **Conclusion:** About half of Indonesian e-cigarette users surveyed perceived e-cigarettes to not be harmful. There is a need for a communication campaign to clearly convey to the public the known and unknown risks of e-cigarettes.

FUNDING: Academic Institution; Nonprofit grant funding entity

PS4-196

INCENTIVIZING THE PRESCRIBER - INPATIENT BASED INCENTIVE PROGRAM TO IMPROVE TOBACCO USE SCREENING AND REFERRAL TO TREATMENT

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Background: Several approaches to improve tobacco use screening and intervention in a hospital setting have been widely studied. They have been going to have limited success and / or benefit in long term compliance for the patient. Methods: We created a prescriber incentive program surrounding tobacco use assessment and treatment for recent year. We reviewed and compared chart data from the past financial year (FY19) to that of FY18. Results: Data not available yet. Conclusions: Expected increased identification of tobacco use status as a diagnosis and improved referrals to medication and counseling.

FUNDING: Unfunded

PS4-197

BODY ESTEEM, WEIGHT CONTROL OUTCOME EXPECTANCIES, AND E-CIGARETTE USE AMONG YOUNG ADULTS

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Significance: Evidence is still scarce regarding the use of e-cigarettes by young people for weight control reasons. This study aimed to test a model in which the prospective association between negative body esteem and e-cigarette use is mediated by weight control outcome expectancies for e-cigarette use. The model was tested across genders. **Methods:** Longitudinal design in which self-report data were collected at 2 time points, 6 months apart, from 2401 multiethnic young adults (Mean age = 21.2; SD = 2.2; 54% women) attending 4-year and 2-year colleges in Hawaii, U.S.A. **Results:** Among women, we found a significant indirect effect of positive body esteem on lower likelihood of current e-cigarette use 6 months later, via lower weight control outcome expectancies, with demographics and baseline e-cigarette use and cigarette smoking accounted for in the model. Among men, however, body esteem was not found to have a significant effect on e-cigarette use, even though significant direct paths were found from body esteem to weight control expectancies and from expectancies to e-cigarette use. **Conclusions:** Based on the current findings, young adult women who have negative body esteem may use e-cigarettes for weight control motives.

FUNDING: Federal

PS4-198

PUFF TOPOGRAPHY FOR 3RD GENERATION ENDS

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Electronic Nicotine Delivery Systems (ENDS) cover a wide array of products with great variation in puffing styles. 3rd generation (3G) ENDS are puffed far more aggressively than 1st and 2nd generation devices with a direct-lung inhalation versus mouth-to-lung puff. The FDA will begin requiring Premarket Tobacco Applications (PMTAs) for all new tobacco products by 2020. Most 3G, sub-ohm ENDS have yet to submit their PMTAs but need to perform evaluations using representative flow rates and powers. 3G ENDS puff topography is poorly characterized but needs to be measured comprehensively to establish "typical" and "intense" puffing regimes. Current topography devices restrict puff airflow and have small upper limits which impact a user's puff topography during measurement. This study describes a puff topography system specifically designed for the high flow rates expected in 3G sub-ohm ENDS and adds temperature measurement capability. Based on a volume of 1 L and duration of 3 s, the expected 3G puff flow rate is 20 L/min. A flow measurement cell utilizing the venturi effect was designed and 3D printed in high resolution (n=10). Each flow cell was calibrated for pressure drop vs flow rate at 30 points from 0-30 L/min and all points were used to construct a model to estimate flow rate and determine variability between flow cells. The flow cell was also equipped with a thermocouple to measure puff temperature. The 3D printed flow cells showed a range of values within +/- 3.5% of model predictions. A two zone regression for flow vs. pressure drop yielded very good fit of data ($R^2 = 0.986$ upper, 0.993 lower) with the zones overlapping at 15 L/min. The accuracy of any given flow cell was within 5% of the true value and an individually calibrated flow cell was within 1%. Temperature measurements were verified to within 0.1 °C using cold junction compensation. This topography device can be field calibrated without pumps and flow controllers, is capable of measuring flow rates up to 30 L/min with accuracy of ~5%, and can measure aerosol temperature over 300°C. This device will allow the characterization of the normal and intense vaping regimes of high flow ENDS which is critical knowledge gap but is necessary for PMTAs.

FUNDING: Unfunded

PS4-199

PARTICIPATORY DESIGN OF A PERSONALIZED GENETIC RISK TOOL TO PROMOTE USE OF SMOKING CESSATION INTERVENTIONS

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Significance: Returning genetic susceptibility test results related to smoking has potential to increase use of tailored treatments and reduce disease risk. However, too little research has focused on the communication of such re-



sults for maximal acceptability and utility. The goal of this study was to engage stakeholders in a participatory co-design process to inform the perceived utility and optimal communication of a personalized genetic risk tool for smoking.

Methods: The personalized “genetics report card” was designed to communicate one’s relative genetic risk (e.g., much above average) related to smoking (lung cancer/COPD/relapse), along with treatment recommendations tailored to genotype. Brief in-person participatory design interviews (n=110) and quantitative surveys (n=100) were conducted with hospitalized patients who smoke, non-patients who smoke, and medical professionals. Design-oriented feedback on the content and format of the personalized genetics report card was thematically analyzed and used to inform development of new versions.

Results: Six iterative versions of the report card were successively evaluated in an evolving “horse race”. Acceptability improved with newer versions, and 92% preferred the final version over its predecessor. Current smokers were more likely to interpret the message of the report card as urging cessation whereas medical professionals typically interpreted the message as informing a genetic role on disease risk. Of the 100 surveyed participants, 75 were interested in receiving smoking-related genetic results. After 34 participants viewed a sample smoking-related genetic risk report, 32 (94%) were interested in receiving a similar personalized report. A plurality (48%) rated the most useful aspect of the report to be “motivate behavioral change”, followed by 27% indicating a primary purpose of “advise specific actions to take”.

Conclusion: Iterative design and feedback with key stakeholders yielded a highly acceptable smoking-related genetic risk report that should be tested in clinical, direct-to-consumer, or other community-based settings to promote use of evidence-based smoking cessation interventions.

FUNDING: Federal; Academic Institution

PS4-200

ENGAGING COMMUNITIES IN ELIMINATING TOBACCO-RELATED DISPARITIES

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Background: Community health workers (CHWs) and Promotores de Salud are the front-line in their communities and are eager to engage in the elimination of tobacco related disparities. **Objective:** Utilizing community based participatory principles, we engaged thirty-nine (39) community health workers and promotores de salud from five distinct racial/ethnic communities (African American, American Indian, Hispanic/Latino, Korean American, low SES Non Hispanic Whites) in our Cancer Center’s catchment area of Los Angeles County in various racial/ethnic low-income communities. **Methods:** Utilizing community-based participatory research (CBPR) principles, we engaged in our research community-based partner agencies. They in turn employed the CHWs and promotores de salud who were trained and supervised by our staff. CHWs participated in conducting the research at the community level, helping us examine violations on tobacco sales, age of sales signs, preference of types of tobacco products, and most prominent sales). Academic partners worked with community partners in a two way system of communication. **Results:** CHWs interviewed 800 tobacco-retailers, and collected observational data in over 700 stores. Tobacco retailers revealed information to CHWs, they would have not otherwise revealed to academic investigators not from their communities. We collected information that was critical for understanding disparities in tobacco arising from the retail environment. **Conclusions:** A two-way system of communication between academic and community partners can ensure cultural appropriateness of research and greater community participation in disparities research.

FUNDING: Federal; Academic Institution

PS4-201

RACIAL AND ETHNIC DIFFERENCES IN TOBACCO REGULATORY COMPLIANCE IN THE RETAIL ENVIRONMENT AMONG LOWER SOCIOECONOMIC COMMUNITIES: WHO IS AT GREATEST RISK?

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Background: There is greater risk of incurring violations in tobacco regulatory compliance in the retail environment of low socioeconomic communities. We hypothesized that retailers located in low-income racial/ethnic communities in particular, would have higher rates of non-compliance with FDA regulatory authority compared to retailers located in low income Non-Hispanic White (NHW) communities. **Methods:** Research was conducted among tobacco retailers in predominant ethnic communities in Los Angeles (African American, Hispanic/Latino, Korean, and Non-Hispanic White). We

examined differences in FDA compliance in low income retail environments. An adapted store observation, utilizing the Standardized Tobacco Assessments for Retail Settings (STARS) was utilized, compiling data in 679 stores. [YR1] Compliance was measured based on overall compliance of FDA regulations in the retail environment (pre-deeming rule), and on age verification violations. **Results:** Approximately 8% of all retailers were considered non-compliant. However, we found that there were more retailers in African American communities (13%) that were considered non-compliant when compared to other communities. In a subset of stores (N=126), we observed compliance with age identification per FDA regulations. Of these stores, sixty-two (62%) percent did not request identification from customers, violating FDA regulations. Retailers in the NHW community were more likely to ask for identification (65%) compared to AA (22%), KA (36%), and HL (44%). **Conclusions:** All low SES communities are vulnerable to FDA violations and thus at risk. However, African American communities have higher non-compliance with FDA regulatory authority when compared to those in the NHW, and Korean American communities. All communities could benefit from culturally tailored outreach and engagement in compliance with FDA regulatory authorities. However, particular attention is needed in African American neighborhoods that are at higher risk of non-compliance. More research is needed to better understand the reasons for non-compliance in African American and other low-income communities.

FUNDING: Federal; Academic Institution

PS4-202

TAILORED DIGITAL BEHAVIOR CHANGE INTERVENTION WITH E-REFERRAL SYSTEM TO INCREASE ATTENDANCE AT UK NHS STOP SMOKING SERVICES (THE MYWAY PROJECT): RESULTS OF A RANDOMISED CONTROLLED FEASIBILITY TRIAL.

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Background: Most smokers express a desire to quit, however UK National Health Service (NHS) Stop Smoking Services (SSS) are only accessed by 5-10% of smokers and uptake is in decline. Smokers who access SSS are 4 times more likely to stop than those who attempt to quit alone. StopApp is a brief, tailored, web-based intervention, applying theory and evidence-based behavior change techniques (BCTs) to address barriers to SSS access. It allows instant appointment booking, at a time and location of choice with text reminders to attend. **Methods:** We conducted a two-arm parallel group feasibility randomised controlled trial of StopApp™ compared with standard promotion and referral to SSSs, with a nested qualitative process evaluation. All current smokers aged over 16 years, regardless of previous SSS use in Warwickshire, UK; were invited to take part from either i) six participating GP practices; ii) community settings (e.g. libraries, children’s centres) or iii) on-line via social media. Measures included smoking status, previous use of SSS, ease of internet access, and motivation to quit (‘Motivation to Stop Scale’), health-related quality of life and other data for health economic analysis. At two-month follow-up objective data relating to booking, attendance, quit dates set and 4-week quit rates were also collected from the SSS where participant consent was given. **Results:** The methodology was effective in recruiting the required sample size (n=120), with expected attrition at follow-up. Recruitment via social media was the most effective but incurred difficulties that the authors describe. The measures appeared acceptable to participants based on missing values and interview findings. Collection of cost and outcome data for an economic evaluation was also deemed feasible for a full trial. There were no differences in demographic variables, smoking status and motivation to quit between the arms. Findings regarding motivation to quit and the number of bookings in the intervention arm are reported. **Conclusions:** The methodology was shown to be effective for the requirements of a full trial. If found to be effective and cost-effective, StopApp is easily scalable and can be rolled out nationally and potentially internationally across SSS, representing a highly cost-effective addition to existing care pathways for stopping smoking.

FUNDING: Nonprofit grant funding entity



PS4-203

NICOTINE AND NON-NICOTINE CONTAINING E-CIGARETTE USE PREVALENCE AND PATTERNS DATA FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2016

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Introduction: Studies largely focus on nicotine-containing e-cigarettes (NiCE); non-nicotine containing e-cigarette (NoCE) user demographics, use prevalence and patterns are largely unknown. This study examines self-reported use and patterns of NiCE and NoCE. **Methods:** We analyzed three waves of adult (18+ years) data from the Population Assessment of Tobacco and Health (PATH) study (Wave 1: 2013-2014, n=32,320; Wave 2: 2014-2015, n=28,632; Wave 3: 2015-2016, n=28,148). We tested associations between Wave 1 current NoCE/NiCE use status and sociodemographic characteristics and assessed the proportion of current NoCE/NiCE users at Wave 1 or Wave 2 who continue to use NoCE or NiCE, switch to NiCE or NoCE, discontinue e-cigarette use, switch to use other nicotine products (ONP), or add ONP use one year later. **Results:** Maintaining the same NiCE/NoCE and ONP use status one year later was the most common use pattern. However, 15.65% of exclusive NoCE users in Wave 2 transitioned to NoCE plus nicotine product use in Wave 3; some exclusive NoCE users transitioned to exclusive NiCE use (17.77% Wave 1-2; 11.55% Wave 2-3). Compared to NiCE users, a higher proportion of NoCE users discontinued use of all products one year later at Wave 2 (11.88% NoCE vs. 5.32% NiCE) and Wave 3 (17.46% NoCE vs. 6.65% NiCE). **Discussion:** Some exclusive NoCE users transitioned to NiCE or added nicotine product use, suggesting there may be other factors (e.g., device familiarity) in addition to the presence of nicotine influencing initiation or sustained use of nicotine products. Limitations include reliance of self-reported items for NiCE/NoCE use.

FUNDING: Federal

PS4-204

INTRINSIC AND EXTRINSIC MOTIVATION TO QUIT SMOKING AMONG FORMERLY HOMELESS SUPPORTIVE HOUSING RESIDENTS

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Background: Although permanent supportive housing (PSH) may reduce barriers to smoking cessation for formerly homeless adults, smoking remains a persistent problem for PSH residents. Understanding motivation among PSH residents may provide direction for intervention efforts best suited for this high-risk population of smokers. **Methods:** Data drew from follow-up surveys conducted with PSH residents (N=171) who were homeless at baseline and were living in PSH for 3-5 years. Participants' baseline demographics (i.e. age, gender, race, sexual orientation, education & military status) were examined as correlates of cessation motivation, measured by the Reasons for Quitting (RFQ) Scale (total scores and subscales of intrinsic [i.e. health concerns, self-control] and extrinsic motivation [i.e. immediate reinforcement, social influence]), in linear regression models. A purposive sample of these residents (n=30) participated in semi-structured qualitative interviews designed to explore cessation motivation. Thematic analysis was followed by qualitative and quantitative data integration to determine convergent and divergent findings. **Results:** Across smokers (n=86), the sole significant correlate of total and subscale RFQ scores was race, with White participants reporting higher overall, intrinsic and extrinsic motivation compared to Black participants. On average, smokers' intrinsic motivation scores were higher than their average extrinsic motivation scores (p<.01). Qualitative data revealed participants' desires for health-focused information that highlighted "the damaging effects of smoking", in vivo health activities to replace habitual smoking, and assistance with prioritization of "more important things" in their lives. Providers who "simply showed they care" about participants and their health and/or who supported participants' cessation via cessation aides facilitated cessation motivation. However, participants also reported needs for further in-depth counseling on use and adherence to cessation aides. **Conclusion:** Findings suggest broad, health-centered cessation interventions that incorporate components of motivational interviewing may be viable for targeting PSH residents' cessation motivation. Cessation efforts that account for racial differences and disparities are warranted.

FUNDING: Federal

PS4-205

VAPING AS A HYPE OVER STEADY USER PATTERNS: A QUALITATIVE LONGITUDINAL STUDY OF ADOLESCENTS' USE OF E-CIGARETTES

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Significance: For the first time in our century, we see the contours of a generation of smoke free youths in Norway. However, increasing use of e-cigarettes among youth internationally, and in the US particularly, has evoked fear for a new nicotine addicted generation. Little is known about how youth use and understand e-cigarettes in a Nordic context. The aim of this study is to explore how the user culture of e-cigarettes unfold among a group of youth over time. **Methods:** Using a longitudinal design we explored vaping trajectories by conducting semi-structured interviews at four points in time, with 118 8th graders between 2015 to their first year in high school, 2019. **Results:** At T1, we found that most had heard about e-cigarettes. The interviewees accounted for the appeal with e-cigarettes related to its novelty and various flavours. Only a few had tried. At T2: All had heard about e-cigarettes. The interviewees emphasised in addition to flavours, harmlessness, performance and accessibility online. About 1/3 had tried, however few had vaped with nicotine, and few owned their own device. At T3: Vaping started to lose status. At T4, use of e-cigarettes was predominantly described as 'childish' and the use as belonging to the past. **Conclusion:** The longitudinal design highlight how vaping and e-cigarettes in this sample occur as a 'hype' over a steady user pattern, with a symbolic meaning of light transgression and novelty that faded in time.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PS4-206

PREVALENCE AND CORRELATES OF LONG-TERM E-CIGARETTE AND NICOTINE REPLACEMENT THERAPY USE. A PROSPECTIVE STUDY IN ENGLAND

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Objectives: To examine the prevalence of, and sociodemographic and smoking-related characteristics associated with, long-term e-cigarette use compared with long-term NRT use. **Design:** Cross-sectional and prospective survey, the Smoking Toolkit Study, with baseline data collected between September 2014 and September 2016 and follow-ups at 6 and 12 months. **Setting:** England. **Participants:** Population-representative sample of 40,933 adults aged 16+. **Main outcome measures:** Prevalence of long-term (≥12 months) use of e-cigarettes and NRT by retrospective self-report among baseline respondents (all adults, n=40,933; smokers, n=8,406), and current use at baseline, 6 months and 12 months in a subsample of smokers who responded to follow-up (n=733). **Results:** Of baseline respondents, 1.5% (95%CI=1.4-1.6%, n=604) of adults and 3.9% (95%CI=3.5-4.3%, n=327) of smokers were long-term e-cigarette users and 0.5% (95%CI=0.4-0.6%, n=205) of adults and 1.3% (95%CI=1.1-1.5%, n=112) of smokers were long-term NRT users. Assessed prospectively, 13.4% (95%CI=10.9-15.9%, n=100) of smokers were long-term e-cigarette users and 1.9% (95%CI=0.9-2.9%, n=14) were long-term NRT users. Among all adults, long-term use by never smokers of either e-cigarettes (0.1%, n=27) or NRT (0.0%, n=7) was rare. Among past-year smokers, long-term e-cigarette and NRT use was higher among older smokers compared with 16-34 year-olds (OR range=1.55-5.21). Long-term e-cigarette use only was lower in smokers who were less educated (OR=0.63, 95%CI=0.49-0.81), from social grades C2DE (OR=0.66, 95%CI 0.52-0.84) and with children in the household (OR=0.66, 95%CI=0.51-0.85). Long-term e-cigarette use and long-term NRT use were higher among smokers more motivated to quit (OR=2.05, 95%CI=1.63-2.60 and OR=2.33, 95%CI=1.57-3.46). **Conclusions:** In the adult population in England, long-term use of e-cigarettes and long-term use of NRT are almost exclusively by current or ex-smokers. Only a minority of past-year smokers retrospectively report long-term e-cigarette or NRT use but this figure may be an underestimate, especially for e-cigarette use, which is more than three-fold higher when assessed prospectively.

FUNDING: Nonprofit grant funding entity



PS4-207

THE EFFECT OF GRAPHIC IMAGES ON VISUAL ATTENTION TO SMOKING-RELATED HEALTH MESSAGING

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SIGNIFICANCE: The WHO Framework Convention on Tobacco Control represented the first global public health treaty to reduce tobacco-related disease. Recognizing the central role of packaging in communicating product information, graphic warning labels were mandated to communicate the dangers of tobacco. Yet, the United States has not adopted a graphic warning rule. Prior to randomization in a US trial on the effects of graphic warnings, we explore how different designs influence the amount of time smokers spend viewing warning labels. **METHOD:** To assess how packaging influences attention to smoking related health warnings, adult daily smokers (n=114) were presented with five cigarette pack designs one-at-a-time in counterbalanced order: a standard US pack, a blank pack devoid of marketing, and three packs with graphic warning labels. Participants wore eye-view camera glasses to capture their visual attention and pack movements when handling the products. Smokers interactions with the packs were coded to quantify the amount of time viewing each warning label region and then gauged across pack conditions. **RESULTS:** On average, graphic packs were held for 119.72±1.53 sec, US packs for 88.52±1.72 sec, and blank packs for 64.75±1.01 sec. Compared to current US packaging, participants spent significantly more time handling graphic designs (b=22.59, 95%CI=15.90, 29.28, p<.001) and less time handling blank designs (b=-17.88, 95%CI=-24.57, -11.20, p<.001). Significantly more time was spent viewing warnings were observed between blank and US pack conditions. Analysis of discrete gazes revealed that during initial exposure to graphic packaging, front facing warning images were viewed an average of 12.47±0.27 times for 5.24±0.35 sec while back of pack image + text warnings were viewed 7.32±0.31 times for 8.50±0.57 sec. **CONCLUSION:** US daily smokers spent significantly more time viewing health warning labels when handling graphic packs than when handling packs with branding removed or standard branded packaging.

FUNDING: Federal; State

PS4-208

PAST YEAR E-CIGARETTE QUIT ATTEMPTS AMONG CALIFORNIA HIGH SCHOOL STUDENTS

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SIGNIFICANCE: The prevalence of current teen e-cigarette use has reached epidemic proportions. As initiation and frequency of use continue to climb at dramatic rates, it is uncertain if youth are thinking about quitting this product. Importantly, it is unknown what percent of teens are attempting to quit e-cigarettes on their own. **METHOD:** Participants were drawn from a statewide representative sample of 10th and 12th grade students (N=130,048) from 256 high schools who participated in the 2017-18 California Student Tobacco Survey. Online self-report surveys of current (past 30-day) tobacco use and past year quit attempts were administered. Among teens reporting current use of e-cigarettes, a weighted population estimate of e-cigarette quit attempts was calculated. Cessation attempt estimates were then calculated for both exclusive e-cigarette users and dual users (i.e., current use of e-cigarettes and cigarettes). Multivariate survey-logistic regressions examined demographic associations with quit attempts. **RESULTS:** Overall, 26.5% (95%CI=24.9%-28.2%) of current e-cigarette users (N=12,021) reported making at least one quit attempt in the past year. Specifically, 27.7% (95%CI=26.2%-29.2%) of exclusive e-cigarette only users and 18.5% (95%CI=15.0%-21.9%) of dual users (N=1,409) reported at least one attempt to quit vaping in the past year. E-cigarette quit attempts were more likely reported by males vs. females (AOR=1.22, 95%CI=1.08-1.38), 10th vs. 12th graders (AOR=1.47, 95%CI=1.31-1.65), and Asians, Hispanics and African Americans vs. Whites (AORs range: 1.28-1.44). E-cigarette quit attempts were less likely to be reported among students with more frequent patterns of e-cigarette use (i.e., 3+ days per month; AOR=0.58, 95%CI=0.51-0.65) and those who currently smoke (AOR=0.70, 95%CI=0.57-0.85). **CONCLUSION:** Presently, over 25% of teens who currently vape have attempted to quit in the past year. Dual users reported marginally less, but substantially meaningful attempts to quit using e-cigarettes. Males, younger students, as well as Asians, Hispanics and African Americans were more likely to report at least one attempt to quit using this product. Youth e-cigarette programmatic strategies are urgently needed to further encourage, and support teen cessation efforts.

FUNDING: State

PS4-209

COMPLIANCE WITH SMOKE-FREE POLICIES IN TWO INDONESIAN CITIES

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Background: Indonesia has a national smoke-free law, but it is not comprehensive. The present study assessed compliance with local smoke-free laws in two cities on the island of Java, Depok and Yogyakarta, to help identify possible areas for improvement. Both Depok and Yogyakarta laws ban smoking in indoor public places. **Methods:** Observational data were collected in Depok (n=762) and Yogyakarta (n=790) from various hospitality venues, government buildings, religious venues and shopping centers. Data collectors conducted observations during February and March 2019 using a mobile application to assess compliance with evidence of smoking (a composite of observed smoking, absence of cigarette litter and/or absence of ashtrays or similar accessories). In addition, the presence of no-smoking signage was also assessed. Descriptive statistics were used to report compliance by venue type, by city. **Results:** In Depok there was evidence of smoking in 47% of religious venues (n=118), 73% of hospitality venues (n=282), 75% of government buildings (n=83) and 69% of shopping centers (n=11). In Yogyakarta there was evidence of smoking in 38% of religious venues (n=113), 72% of hospitality venues (n=261), 55% of government buildings (n=57) and 52% of shopping centers (n=12). Ninety six percent (n=107) of government buildings and 88% of shopping centers (n=14) in Depok had no-smoking signs while only one quarter of hospitality venues (24%, n=93) and religious venues (25%, n=63) had no-smoking signs present. Most government buildings in Yogyakarta (85%, n=88) and 57% of shopping centers (n=13) had no-smoking signs posted while only 24% of the religious venues (n=72) and hospitality venues (n=88) observed had no-smoking signs posted. **Conclusion:** The level of compliance in both cities varied by venue type and city. Compliance was especially poor within hospitality venues in both cities. Distribution and placement of no-smoking signs at public places may also improve compliance. With strong, coordinated and uniform enforcement of city laws, these cities could help protect their citizens from exposure to tobacco smoke.

FUNDING: Unfunded; Nonprofit grant funding entity

PS4-209

ONLINE COURSE ON TOBACCO CONTROL: SERVING A GLOBAL COMMUNITY

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Background: The state of global tobacco control continues to evolve. New tobacco control practitioners have joined the movement, while the tobacco industry continues to aggressively deploy strategies aimed at derailing tobacco control efforts. Tobacco control practitioners in low- and middle-income countries (LMICs) do not always have access to timely and reliable information sources and materials that are relevant to address current developments in the fight against the tobacco epidemic in their regions. An online course was developed in 2018 to address this gap. **Methods:** A working group of tobacco control experts reviewed our course on tobacco control that was launched in 2007, and provided suggestions about the content, features and subject matter experts (SMEs) from LMICs for a new course. The new course provides a global perspective of key tobacco control topics using examples and case studies from around the world. SMEs (19 of the 27 are from LMICs) reviewed course content and provided audio recordings of highlighted content. **Results:** A new, free 6-module online course (<https://www.globaltobaccocontrol.org/content/global-tobacco-control-learning-experts-2018>) was launched in September 2018 and is now available in eight languages (Arabic, English, French, Mandarin, Portuguese, Russian, Spanish and Vietnamese). Users can access the course with laptops, tablets, and cellphones. In addition, the course is accessible for people with disabilities. The course has 1,339 registered users from 82 countries as of August 2019. Sixty-three percent of registered users have less than a year of tobacco control experience; 8% have over 10 years of experience. While most users (87%) to date have started taking the first module in English, there are people taking it in each of the eight languages. **Conclusion:** In an age of competing information sources, finding accurate fact-based knowledge can be a challenge. This online



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course attempts to bring key issues in global tobacco control to users around the world. Additional targeted strategies to promote the course in LMICs are needed especially among those new to tobacco control.

FUNDING: Nonprofit grant funding entity



POSTER SESSION 5

PS5-200

THE PROCESS OF DEVELOPING A NEW OUTCOME MEASURE TO ASSESS THE IMPACT OF TOBACCO- AND/OR NICOTINE-CONTAINING PRODUCTS ON HEALTH AND FUNCTIONING

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Significance. Less harmful tobacco-and/or nicotine-containing products (TNP) or reduced-risk products (RRPs) are being developed to advance tobacco harm reduction efforts. However, there is currently a lack of measures sensitive enough to assess health and functioning status in cigarette smokers who switch to these products. As part of the ABOUT™ Toolbox initiative, the ABOUT-Health and Functioning project was initiated with the aim to develop a new self-report measurement instrument to assess the impact of TNPs on health and functioning. **Methods.** The instrument development follows the U.S. Food and Drug Administration's Guidance on Patient-Reported Outcome Measures. The preparatory phase of the development included a scoping literature review, secondary analyses of existing qualitative focus groups (n = 29) and individual interviews (n = 40), and convening of an expert panel. The current phase includes concept elicitation interviews in consumers who switched from cigarette smoking to using an RRP and a global Delphi panel for further expert opinion solicitation. **Results.** Reanalysis of qualitative data, expert panel feedback, and review of 97 publications led to identification of 69 relevant concepts. 33 existing measures were also retrieved to inform item generation and item banking. Key concepts include signs and symptoms of TNP use withdrawal and associated health effects of TNP use; physical, cognitive, social, and emotional functioning; perceived benefits of using TNPs; and general health perceptions. These concepts informed the interview guide for ongoing qualitative studies in German and Japanese consumers who switched from cigarette smoking to using an RRP (i.e., a heated tobacco product). A Delphi panel with international experts in the field was also initiated to gain consensus on the concepts and assess their relative importance. **Conclusion.** The new instrument will enable accurate assessment of relevant dimensions of health and functioning impacted by TNP use. Next steps in the development include reconvening the expert panel, refining the conceptual framework based on ongoing studies, and designing and validating the instrument.

FUNDING: Tobacco Industry

PS5-201

CROSS-CULTURAL DEVELOPMENT OF THE ABOUT™-DEPENDENCE INSTRUMENT: RESULTS OF THE LINGUISTIC VALIDATION INTO GERMAN, ITALIAN, JAPANESE, AND RUSSIAN

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Background: Considering the range of currently available tobacco and nicotine-containing products and the growing prevalence of multiple product use, existing instruments are not fit for purpose for valid comparison of dependence among different products and in users of multiple products. To address these limitations, the ABOUT™-Dependence instrument was developed in English. The instrument comprises 12 items and three domains of perceived dependence: extent-of-use [timing] (two items), behavioral impact (five), and signs and symptoms (five). The objective of this research was to assess the applicability of ABOUT™-Dependence instrument in other countries, such as Germany, Italy, Japan, and Russia. **Methods:** As part of its cross-cultural development, a draft version of the instrument was subjected to translatability assessment (TA). The final version was then put through a linguistic validation (LV) process involving five steps: conceptual analysis, translation (forward and back translation into English), cognitive interview tests, external review, and proofreading. Translation issues were categorized as cultural, idiomatic (practicality), semantic (meaning), or syntactic (grammar). **Results:** Owing to the TA process, the LV did not indicate any culture-related issues and identified a total of 34 different concerns—semantic (Se, 17), idiomatic (I, 11), and syntactic (Sy, 6)—with the highest number of concerns (16 issues) identified in the Japanese (J) and

Russian (R) versions: Se (J:10/R:7), Sy (J:3/R:3), and I (J:3/R:6), of which only four were common (2 Se, 1 Sy, and 1 I). For instance, the "HAD to have one" expression in the English version was modified to "I must use it" in order to transfer the emphasis provided by the uppercase letters into the Japanese statement. **Conclusions:** Combining TA and LV helped us prepare satisfactory translations of the ABOUT™-Dependence instrument. The translated versions capture the concepts of the original version and are reliably applicable to Germany, Italy, Japan, and Russia. This provides opportunities for international initiatives to compare levels of perceived dependence among different products and in users of multiple products.

FUNDING: Tobacco Industry

PS5-202

CHARACTERIZATION OF CARBONYLS COMPOUNDS FROM AEROSOLS EMITTED BY ELECTRONIC CIGARETTE (E-CIG)

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Introduction: E-cig is a device more and more used, almost 41.7% of smokers try the e-cig. For the safety of the consumer is necessary to know the composition and the quality of the e-liquid aerosols. Some studies show that during vaporization of the e-liquid some carbonyls may be found in the aerosol. The aim of this research is to find a protocol to capture and to define a repeatable and reliable method to qualify and quantify them. **Methods:** The material used in this study is an Eleaf GS-air M Atomizer with a 1,5 Ω coil and an Eleaf IStick TC 40 battery. Four of the most used French e-liquids were analyzed, and compared to normalized reference, used by Afnor for collaborator study. Aerosols are generated in triplicate on a vaping machine with parameters following French experimental norm XPD90-300-3 (puff duration 3s, puff volume 55mL, puff interval 30s). The test consists of ten sets of twenty puffs. Analysis were made with UPLC-DAD. The protocol was first developed on a neutral basis and then applied to e-liquids with flavor. The quantity of vaporized liquid is measured by weighting the e-cig after each series. **Results:** The mass balance seems to prove that a repeatable aerosol is generated. The capture of aerosols has been optimized through an experimental design with several parameters: temperature, capture liquid and impingers. The temperature must be as low as possible (carbonyls are very volatile) and the capture liquid shall aqueous solution considering the solubility of the DNPH and the working temperature. Concerning impingers, the greater exchange is when no clogging happened and small pore size enhanced aerosol-liquid exchange. Taking into account this optimization, carbonyls (formaldehyde, acetaldehyde, acrolein, butanedione and pentanedione) are recovered. Thermal degradation products from propylene glycol and glycerin are low and under the limits fixed by the AFNOR. Tests performed several times on the same e-liquid confirmed the reliability and the repeatability of our method of quantification and allow her validation. **Conclusion:** All these parameters permit to conclude that the generation of aerosol is controlled and the safety of the consumer is guaranteed. The next step is to expand this method to other carbonyls (propanal, crotonaldehyde...)

FUNDING: Other

PS5-203

FACTORS ASSOCIATED WITH REGULAR NICOTINE SALT POD SYSTEM USE AMONG SMOKERS ABSTAINING FROM COMBUSTIBLE CIGARETTES

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SIGNIFICANCE: Previous studies have found a positive association between regular use of e-cigarettes/Nicotine Salt Pod Systems (NSPS) and abstinence from combustible cigarette use among smokers. This study assessed factors associated with daily use of NSPS among both smokers who abstained from combustible cigarette smoking ("switchers") 6 months after initiating NSPS use and those who continued smoking. **METHODS:** Adult current smokers (age≥21) who bought a JUUL ("NSPS") starter kit and completed baseline and 180-day follow-up assessments (N=18,834) reported demographic characteristics, smoking history and motivations for NSPS purchase at baseline and past 30-day cigarette smoking and NSPS use at 180-day assessment. The sample was stratified by switching (past 30-day abstinence from smoking) success status at 180 days; differences in baseline characteristics among daily/non-daily NSPS users in each subgroup were assessed. The sample was divided into independent training and validation sets, and logistic regression models examined associations between baseline characteristics and daily/non-daily NSPS use at 180-days in each subgroup. **RESULTS:** Among switchers, daily NSPS users (vs. non-daily users) were more likely to be daily smokers at baseline, have a smoking history of >10 years at baseline, and



cite quitting smoking and concern about effects of smoking as reasons for purchase. Smoking for >20 years (aOR = 2.7, CI = 1.5-4.9) and daily smoking at baseline (aOR = 1.8, CI = 1.5-2.4) were associated with daily NSPS use at 180-days in the switching subgroup. Among smokers, believing NSPS to be less harmful than cigarettes (aOR = 1.4, CI = 1.1-1.8) and smoking for 10-20 years (aOR = 1.6, CI = 1.0-2.6) were significant predictors of daily NSPS use. Logistic models from training samples performed well in validation samples (accuracy scores ranging from 0.68 - 0.73). **CONCLUSIONS:** This study provides new longitudinal data on attributes associated with regular NSPS use among smokers who switch from combustible cigarettes. Identifying factors associated with NSPS use and switching behavior may inform likelihood of behavior change or support development of techniques to aid switching.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-204

HOW DOES SUSCEPTIBILITY PREDICT ONSET OF TOBACCO PRODUCT USE AMONG YOUNG ADULTS IN THE UNITED STATES? A FOCUS ON SMOKELESS AND E-VAPOR TOBACCO PRODUCTS

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Background: Susceptibility to tobacco use has been shown to predict the onset of tobacco use. It is unclear whether the predictive value varies based on (a) the particular susceptibility measure, (b) the tobacco product of interest, or (c) the individual's experience with other tobacco products. This study aims to assess the prediction structures linking susceptibility measures with the onset of e-vapor and smokeless tobacco (ST) products among young adults. **Methods:** The study population is US civilian young adults 18-24 years of age, sampled in the longitudinal Population Assessment of Tobacco and Health study. Susceptibility to use ST and e-vapor products was assessed via two sets of questions about curiosity, likelihood of try next year, likelihood of use if a best friend offers, respectively, at wave 2. Outcome was the onset of e-vapor or ST use between wave 2 and 3. Lifetime and current use of tobacco products was assessed via self-report. Poisson regressions were used for analysis. Analyses for SLT was restricted to males only. **Results:** For both e-vapor products and ST, all three susceptibility measures predicted the onset of product use individually. The prediction tended to be stronger among baseline never tobacco users compared to current users and tended to be stronger for SLT compared to e-vapor products. For SLT, peer offering is the strongest predictor among never tobacco users (RR=41.4, 95% CI=5.1, 335.3); curiosity is the strongest predictor among tobacco users (RR=4.6, 95% CI=1.2, 17.5) in multivariate analyses with all three susceptibility measures included. For e-vapor products, intention to try is the only robust predictor for e-vapor onset among never tobacco users in multivariate analyses (RR=3.0, 95% CI=1.5, 6.0). **Conclusions:** Susceptibility measures predict the onset of SLT and e-vapor use among young adults. Results suggest that tobacco use history, the specific product under study, and particular measure should be considered when evaluating the prediction of product onset using susceptibility measures.

FUNDING: Tobacco Industry

PS5-205

PHARMACOKINETIC AND PHARMACODYNAMIC EVALUATION OF NICOTINE SALT POD SYSTEM, ELECTRONIC CIGARETTE, COMBUSTIBLE CIGARETTE, AND NICOTINE GUM AMONG ADULT SMOKERS

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OBJECTIVE: Limited data are available on the pharmacokinetic and pharmacodynamic effects of the nicotine salt pod system (NSPS; JUUL Labs, Inc.), a novel electronic nicotine delivery system (ENDS). This clinical, in-laboratory study evaluated the nicotine delivery, product appeal and subjective effects of NSPS compared to combustible cigarettes, a comparator electronic nicotine delivery system (ENDS) and nicotine gum. **METHODS:** NSPS-naïve adult smokers (N=65; 50.8% female; mean age=41.2) completed a 7-arm within-subjects cross-over product-administration study while confined to a clinical laboratory setting. On each study day participants self-administered 10 puffs of their usual brand combustible cigarette, NSPS in four flavors (tobacco, mint, creme, mango [all 5% nicotine]), comparator ENDS (4.8% nicotine) and nicotine gum (4mg). After each product administration, nicotine delivery pharmacokinetics and ratings of product appeal and subjective effects were assessed. **RESULTS:** Maximum plasma nicotine delivery (C_{max}; ng/mL) of combustible cigarettes (Mean[SE]=15.29[0.69]) was greater than that of NSPS (Means[SEs]=6.52-8.59[0.69];

$ps<0.001$), comparator ENDS (Mean[SE]=6.77[0.69]; $p<0.001$), and nicotine gum (Mean[SE]=5.54[0.69]; $p<0.001$). Mean time to maximal plasma nicotine concentration (T_{max}; minutes) was significantly shorter in the NSPS conditions (Mean[SE]=7.32-8.27[1.22-1.23]) compared to nicotine gum (Mean[SE]=54.38[1.23]; $ps<0.001$), and NSPS did not significantly differ from combustible cigarettes (Mean[SE]=8.82[1.22]; $ps=0.22-0.94$) or comparator ENDS (Mean[SE]=[1.22]; $ps=0.37-0.77$). Product liking of combustible cigarettes (Mean[SE]=93.28[3.68]) was greater than NSPS (Means[SEs]=58.65-69.93[3.68-3.73]; $ps<0.001$), and NSPS was more appealing than nicotine gum (Mean[SE]=40.96[3.71]; $ps<0.001$). **CONCLUSIONS:** Controlled administration of NSPS among adult smokers resulted in nicotine delivery and product appeal that were less than that of combustible cigarettes but greater than nicotine gum. Based on their pharmacokinetic profile and product appeal, NSPS likely has lower potential for abuse than combustible cigarettes and may have sufficient product appeal to support substitution for combustible cigarettes among adult smokers.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-206

ASSOCIATION OF INITIAL NICOTINE SALT POD SYSTEM (NSPS) SUBJECTIVE EFFECTS AND SUBSEQUENT NSPS USE AND SMOKING AMONG NEVER AND FORMER SMOKERS

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OBJECTIVE: Previous studies have assessed subjective effects of electronic nicotine delivery systems (ENDS). However, there is little data on subjective effects of nicotine salt pod system (NSPS; JUUL Labs, Inc.) use, and it is unknown if initial experiences with NSPS use are prospectively associated with continued NSPS use and cigarette smoking among former and never smokers. **METHODS:** Adult former smokers (ever-smoked a cigarette but not in past 30 days; N=8,093) and never (never smoked a cigarette in lifetime; N=3,365) smokers who recently purchased NSPS completed baseline, 30-, 60-, 90- and 180-day follow-up assessments. At baseline, participants completed the satisfaction, psychological reward, enjoyment of respiratory sensations and aversion subscales of the Modified Cigarette Evaluation Questionnaire. At each follow-up, participants reported if they had used NSPS and/or smoked in the past 30-days (yes/no). Repeated-measure logistic regression models, adjusted for sociodemographics, assessed associations of initial subjective effects and NSPS use and smoking across follow-ups. **RESULTS:** Among former smokers, greater initial satisfaction (aOR[95% CI]=1.12[1.09, 1.15]), psychological reward (aOR[95% CI]=1.04[1.03, 1.05]) and enjoyment of respiratory sensations (aOR[95% CI]=1.24[1.17, 1.31]) were significantly associated with increased odds of NSPS use across all follow-ups; aversion was associated with decreased odds of NSPS use (aOR[95% CI]=0.96[0.94, 0.99]). Among never smokers, satisfaction (aOR[95% CI]=1.07[1.04, 1.10]) and enjoyment of respiratory sensations (aOR[95% CI]=1.12[1.05, 1.19]) were associated with increased odds of NSPS use across all follow-ups; aversion was associated with decreased odds of NSPS use (OR[95% CI]=0.96[0.93, 0.99]). Positive subjective effects were not associated with subsequent combustible cigarette smoking among former smokers ($ps=0.56-0.88$). **CONCLUSIONS:** Early positive responses to NSPS use among former and never smokers were associated with continued NSPS use, but not subsequent combustible cigarette smoking among former smokers. Initial positive experiences with NSPS may be an important factor for continued NSPS use among never and former smokers and smoking abstinence among former smokers.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-207

ASSOCIATION OF FLAVORED NICOTINE SALT POD SYSTEM USE AND SUBSEQUENT INITIATION OF SMOKING AMONG ADULT NEVER SMOKERS

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OBJECTIVE: It is unknown if use of flavored (vs. tobacco-flavored) nicotine salt pod systems (NSPS, JUUL Labs, Inc.) is associated with subsequent initiation of combustible cigarette smoking among adult never smokers. This study assessed if use of NSPS in non-tobacco (vs. tobacco) flavors among adult never smokers is prospectively associated with initiation of combustible cigarette smoking over a six month period. **METHODS:** U.S. adult never smokers (i.e., never smoked even a puff of a cigarette in lifetime) who recently purchased an NSPS starter kit (N=2,678; 63.8% male; 76.4% White; mean age [SD]=24.78[6.97]) completed 30-day, 60-day, 90-day and 180-day assessments as part of



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a longitudinal study. Participants reported the primary NSPS flavor they used most often in the past 30-days at the 30-day assessment (tobacco; mint/menthol; non-tobacco/mint/menthol [NTM]), and if they had smoked in the past month at subsequent assessments (yes/no). Repeated-measure logistic regression models, adjusted for sociodemographic covariates, NSPS use frequency, and susceptibility to smoking (e.g., "Do you think you will try smoking a cigarette in the next year?"), assessed the association of primary NSPS flavor use and combustible cigarette initiation across follow-ups. **RESULTS:** The majority of never smokers used NTM flavors (53.7%), followed by mint/menthol (39.6%) and tobacco flavors (6.6%). A total of 266 (9.9%) never smokers initiated smoking at any point during the follow-up period; four individuals (0.15%) reported smoking at all three follow-up time points. Compared to users of tobacco flavors, mint/menthol (aOR[95% CI]=0.48[0.30, 0.75]) and NTM (aOR[95% CI]=0.46[0.29, 0.71]) flavor use was significantly associated with lower odds of combustible cigarette smoking initiation. At the 180-day assessment, past 30-day smokers (N=95; 3.5% of sample) reported smoking, on average, 8.80 (SD=8.29) days in the past 30-days and 3.38 (SD=4.03) cigarettes/day; frequency and intensity did not significantly differ across follow-ups ($p>0.34$). **CONCLUSIONS:** Adult never smokers who used NSPS in non-tobacco (vs. tobacco) flavors were less likely to initiate cigarette smoking. Among never smokers who initiated smoking, intensity and frequency of smoking did not increase over the six-month follow-up period—suggesting that, on average, patterns of smoking remained non-daily and low intensity.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-208

PHIM R WEB APPLICATION CAN HELP MODEL THE HEALTH IMPACT OF INTRODUCING A REDUCED RISK TOBACCO PRODUCT IN THE US

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Background. Tobacco harm reduction, as a public health strategy, encourages smokers to quit smoking or switch completely to reduced-risk products (RRP)* aimed at reducing smoking related harm. Computational model such as the Population Health Impact Model (PHIM) can help estimate the health impact of these products at the population level. Substantial modeling work has been conducted by using PHIM. PMI's FDA MRTP application includes PHIM results for the U.S., related to a heat-not-burn tobacco product (IQOS® with HEETS®). These results are available the Population Health Impact Model web application (PHIM R), an online platform for our PHIM model (<https://www.phimr.science>). **Methods.** US data sources used for modeling have been evaluated and verified, and the results have been published. Most parameters specific to the modeling process and data availability can be adjusted. The simulation period is a hindcast from 1990 to 2010, covering the U.S. population (10-79 years old), with a 1-year follow-up interval. The product and f-factor (RRP effective dose) are variable parameters. Different scenarios can be tested in PHIM R by also adjusting RRP Tobacco Transition Probabilities (TTPs), producing estimates of smoking-attributable mortality and years of life saved over a 20-year period after the introduction of an RRP (per year, sex, and disease: lung cancer, COPD, IHD, and stroke). Simulation results are provided in the web interface and a report (with raw data) can be downloaded. **Results.** PHIM R provides a fully transparent methodology and modeling results, which can be useful to regulatory, policymaking bodies and public health practitioners as well as modeling experts. For comparative purposes, the US modeling results, submitted with PMI's FDA MRTP application, can be repeated in PHIM R with various scenarios representing different uptakes of an RRP product in the US. PHIM R is intended to be fully flexible and, with imported data, can model scenarios for any country of interest. **RRP" is the term PMI uses to refer to products that present, are likely to present, or have the potential to present less risk of harm to smokers who switch to these products versus continued smoking.

FUNDING: Tobacco Industry

PS5-209

DEVELOPING A EUROPEAN TECHNICAL STANDARD FOR E-LIQUID INGREDIENTS

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CEN TC 437/WG 3 is the working group (WG) within the European standards organisation developing "Requirements and test methods for e-liquids". Aim is to ensure a good level of consumer safety, in a practical, enforceable way. To achieve this, industry, regulators, consumers and other stakeholders cooperate to translate science and best practice into workable guidelines. Standards reflect the current state of knowledge and thus require regular updating. Here we present the sub-project of developing a first-generation e-liquid ingredients standard: should it contain ingredients specific restrictions, or require case by case toxicological risk assessments (TRA)? Detailed WG considerations will be presented, related to the following dilemma. Given the variations in vaping products, a TRA for each ingredient, in each e-liquid, specific to the vaping devices it could be used in, would be the most thorough approach scientifically. However, with great variation in resources available to regulators and producers, minimum consumer protection levels would likely be compromised, making specific restrictions an obvious solution. However, positive lists inhibit innovation, negative ingredient lists can never be comprehensive and are often misunderstood or compromised, and pre-set level restrictions would be based on today's state of the art, potentially stalling future innovation, or no longer being appropriately protective by the time of publication. Additionally, given the diversity of the category, comprehensive, scientifically sound restrictions would be complicated to develop. Therefore the WG favours a combination approach. A TRA is required for each ingredient, considering foreseeable consumer use. But, to ensure applicable consumer safety regardless of TRA quality, additional specific requirements are set. These focus on purity of ingredients, and both a "functional" and a specific negative list. The "functional" negative list excludes ingredients with certain roles, toxic properties or on specific external lists from scientific committees. The specific list highlights ingredients or properties known (not just suspected) to cause issues when used in vaping products.

FUNDING: Unfunded; E-cigarette/Alternative nicotine products Industry; Tobacco Industry; Other

PS5-210

A 12-MONTH RANDOMISED, CONTROLLED TRIAL EVALUATING THE EFFECTS OF SWITCHING FROM SMOKING TO USING A TOBACCO HEATING PRODUCT ON HEALTH EFFECT INDICATORS: 90-DAY BIOMARKERS OF EXPOSURE

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Significance: Smoking-related disease risk is known to correlate with duration and intensity of exposure to cigarette smoke toxicants. Tobacco harm reduction, replacing smoking with potentially reduced-risk nicotine products, could offer substantial health benefits to those who will otherwise continue to smoke. Confined 5-day clinical studies have shown that toxicant exposure reduces when using the glo tobacco heating product compared to smoking cigarettes. In addition to evaluating the impact of switching to glo on a range of health effect indicators over 12 months, our current study aims to test whether sustained reductions in toxicant exposure are achieved in an ambulatory setting. **Methods:** Regular smokers were randomized to either continue smoking (CTS; N=79) or use glo (N=197) for one year. Arms of never-smokers (N=40) and of regular smokers intending to quit (N=190) who were provided with assistance to do so were also enrolled. Biomarkers of exposure (BoE) to a suite of cigarette smoke toxicants were measured at baseline and throughout the study, along with a haemoglobin adduct of N-(2-cyanoethyl)valine (CEVal) as a novel biomarker for compliance with the restrictions on combustible tobacco use. **Results:** A planned interim analysis was performed on a subset of subjects (CTS (N=33), glo (N=76), cessation (N=133) and never-smoker (N=37)), with sufficient power to meet the 90-day objectives. The BoE endpoints showed rapid, significant reductions in the levels of BoE in the glo arm compared to the CTS arm, and these reductions were sustained throughout 90 days. 24-hour excretion of several BoE, including markers for aromatic amines, benzene, acrylonitrile, crotonaldehyde and 1,3-butadiene, reached similar levels in the glo arm as in the smoking cessation and/or never-smoker arms. Prespecified thresholds for CEVal indicate a high level (80%+) of compliance in this interim analysis. **Conclusion:** The findings demonstrate that when smokers switched from smoking combustible cigarettes to using glo, reductions in their exposure to smoke toxicants were sustained for the 90-day period. This shows that glo is a potentially reduced exposure tobacco product.

FUNDING: Tobacco Industry



PS5-211

U.S. ADOLESCENTS' VIEWS AND BELIEFS ABOUT NICOTINE AND THE HARMS OF E-CIGARETTES

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Significance Within the context of the reported rise in youth use of e-cigarettes within the United States there is an increasing need to obtain detailed information on young peoples' knowledge and awareness around their nicotine exposure where they are using vaping devices. This presentation will outline the extent to which young people in the U.S. understand the presence of nicotine within e-cigarettes and their views as to the harms of nicotine within e-cigarettes and conventional cigarettes. **Methods.** Online cross-sectional survey of 9,865 U.S. adolescents aged 13 to 17. **Results** 13.2% of the adolescents surveyed reported having smoked within the last 30 days and 15.7% had used a JUUL vaporizer within the last 30 days. 57.5% of adolescents believed that nicotine within e-cigarettes was equally as addictive as nicotine within conventional cigarettes. However, 35.7% of adolescents who had used an e-cigarette within the last 30 days thought that nicotine within e-cigarettes was less harmful than that within conventional cigarettes. More than a third of current e-cigarette users thought that fruit flavored e-liquids were safer than tobacco flavored e-liquids. 73.8% of adolescents thought that vaping could be harmful to the lungs with that proportion reducing to 58.1% in the case of current e-cigarette users. 20.6% of current e-cigarette users disputed that e-cigarettes contained chemicals that could have a harmful effect on ones' lungs. **Conclusions** Within the growth in the use of e-cigarettes by young people in the United States there is an urgent need to increase young peoples' awareness of the harms of e-cigarettes, the presence of nicotine within e-liquids, and the fact that flavored e-liquids are no less harmful than e-liquids flavored to taste like tobacco.

FUNDING: Tobacco Industry

PS5-212

SELECTION AND PRECLINICAL CHARACTERIZATION OF FLAVOR MIXTURES USING STRUCTURAL GROUPING

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Many flavor compounds used in e-liquids are generally recognized as safe (GRAS) for oral consumption, however, the respiratory effects of most flavors are unknown. Preclinical inhalation studies can provide toxicity hazard data to assess the inhalation risk of flavors in e-vapor aerosols. Considering the number of available flavors and the numerous potential flavor combinations, toxicity testing of each individual compound or formulation may not be always feasible. Therefore, we used a structural grouping approach to select representative compounds and formulate e-liquid flavor mixtures that may reflect over 200 flavors commonly used in e-liquid formulations. Flavors were first grouped into 38 structurally distinct groups and worst-case representatives from each group were selected based on toxicological endpoints. The selected flavors were prepared into a total of 4 concentrates (pre-blends) based on their physicochemical properties. Pre-blends were then mixed into the final e-liquid test formulations (total flavor loads up to 18% w/w) and tested for stability. The pre-blends and test formulation (e-liquid) were screened for biological activity using in-vitro testing: genotoxicity (Ames and micronucleus [MN]) and cytotoxicity (Neutral Red Uptake [NRU]). The test formulations were negative in genotoxicity (Ames and MN) assays but were cytotoxic in all three assays. Cytotoxicity assessment of pre-blends indicated that certain flavors may contribute more to cytotoxicity of test formulations than other flavors. Additionally, to confirm flavor transfer, aerosols from test formulations were generated using a capillary aerosol generator and all monitored flavors were found in the aerosol. PG, glycerin, and nicotine content, as well as pH of the aerosol, were comparable with those of the e-liquid, and particle size was within respirable range (MMAD~1 µm, GSD < 2). Altogether, this structural grouping approach can be used for selection and characterization of representative flavor mixtures that could support product development with respect to selection of flavor ingredients.

FUNDING: Tobacco Industry

PS5-213

CONTROL MEASURES FOR ASSESSING COMPLIANCE IN LONG-TERM POTENTIALLY REDUCED RISK PRODUCT SWITCHING STUDIES

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Recently, clinical studies have shown reductions in exposure to tobacco smoke toxicants when smokers of conventional cigarettes switch to tobacco heating products (THP). These are generally short-term confined studies where compliance is well controlled. However, to investigate whether these reductions in exposure to cigarette toxicants can translate to reductions in smoking-related health risks, long-term studies are required. In this case it is very difficult to conduct these studies in a confined environment and therefore ambulatory studies are the preferred approach, with subjects visiting the clinic at specific timepoints. Therefore, the potential for non-compliance, where the subject smokes conventional cigarettes and not the assigned THP, is high. To address this, a year-long study examining health effect indicators when a smoker switches to using the glo THP in the UK (ISRCTN81075760) has incorporated a biomarker of compliance, the haemoglobin adduct of acrylonitrile, *N*-(2-cyanoethyl)valine (CEVal). This paper presents the results of a planned interim analysis of CEVal after 90 days. This study was approved by a local research ethics committee and run in accordance with ICH-GCP. Randomisation was carried out to assign regular smokers to either continue smoking (CTS; N=79) or switch to using glo (N=197). In addition, a group of regular smokers who intended to quit (N=190) with assistance provided and a group of participants who have never smoked (N=40) were also enrolled. Blood samples were taken at baseline, and days 30, 60 and 90 for all arms, except the never smokers' where samples were taken at baseline and day 90. CEVal was measured in all blood samples and showed reductions in the glo and cessation arms between baseline and day 90, whereas there was no change in CEVal levels in the never smokers. This data shows that CEVal has the potential to be a long-term biomarker of compliance in Potentially Reduced Risk Product switching studies.

FUNDING: Tobacco Industry

PS5-214

ASSESSING THE HEALTH EFFECTS OF LAUNCHING TOBACCO HEATED PRODUCTS IN JAPAN

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Heated tobacco products (HTP) manufacturers chose Japan as one of the earliest markets to commercialise these products. Now HTPs are well established in Japan with volumes reaching 34.6 billion sticks in 2018. Japan provides the ideal setting to investigate patterns of use related to HTPs as well as evolving consumer perceptions about these products. We report here, the results of the first wave of a country wide survey carried out in 2019 as follow up of previous pilot wave reported in 2018. Our multi-stage sampling survey was completed between February and March of 2019 by 5,306 participants across Japan. We estimated that overall prevalence of tobacco and nicotine products was approximately 17.6%, with HTP use above 5% prevalence. Initiation of HTPs use was formed predominantly by current smokers with initiation around 7% started HTP use in the last 12 months. In contrast, a small proportion of never users of tobacco products (0.2%) initiated HTP use in the last 12 months. Finally, we used the combined data from this first wave and pilot to adjust our previous projections from our population model.

FUNDING: Tobacco Industry

PS5-215

SEGMENTING DUAL USERS: ROLE OF FREQUENCY OF NON-COMBUSTIBLE TOBACCO PRODUCT USE AND THE LIKELIHOOD OF TRANSITIONING AWAY FROM CIGARETTES

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Significance: Dual use may be a critical stage for the transition from combusted cigarettes to reduced-harm tobacco products. Prospective studies have shown that most dual users continue cigarette smoking at follow-up. More refined assessments of dual use behavior can provide better insight into the likelihood that dual users will transition



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away from smoking. This study aims to estimate the transition to nonsmoking among dual users of cigarettes and smokeless tobacco (ST), as well as cigarettes and e-cigarettes. **Methods:** Using Population Assessment of Tobacco and Health study data, we segmented adult current dual users at Wave 1 (2013-2014) based on the number of days they had used each product in the 30 days prior to the assessment: Infrequent Duals (use each product on ≤ 19 days), Vapers/Dippers who Smoke (vape/dip on ≥ 20 days, smoke on ≤ 19 days), Smokers who Vape/Dip (smoke on ≥ 20 days, vape/dip on ≤ 19 days), and Frequent Duals (use each product on ≥ 20 days). For each segment, we estimated the likelihood of not smoking at Wave 2 (2014-2015), at Wave 3 (2015-2016), and at both Wave 2 and 3. **Results:** Overall, 12% of Wave 1 ST-cigarette dual users were not smoking at Wave 2, 20% at Wave 3, and 11% at both waves. Differences in not smoking were observed across segments at follow-ups. Dippers who Smoke and Infrequent Duals had the highest likelihood of not smoking at both Wave 2 and 3 (35% and 20%, respectively), followed by Frequent Duals (12%). Smokers who Dip, the largest segment of dual users, had the lowest likelihood of not smoking (3% at both Wave 2 and Wave 3). Pairwise comparisons showed no robust differences between Infrequent Duals and Dippers who Smoke, and both had higher likelihood of stopping smoking than Frequent Duals and Smokers who Dip. It is noteworthy that Frequent Duals are more likely to stop smoking compared to Smokers who Dip at follow-ups. Similar results are observed for e-cigarette-cigarette dual users. **Conclusion:** There are substantial variations in the likelihood of stopping smoking among dual users. For dual users, frequent use of non-combustible products is an important factor for transitioning away from smoking.

FUNDING: Tobacco Industry

PS5-216

CHARACTERIZATION OF NICOTINE PHARMACOKINETICS FROM USE OF REDUCED NICOTINE CIGARETTE PROTOTYPES IN ADULT SMOKERS

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SIGNIFICANCE: In March 2018, FDA issued an advance notice of proposed rulemaking (ANPRM) on a nicotine standard for conventional cigarettes to make them minimally- or non-addictive. Currently there are limited data available on the relationship between the nicotine content in tobacco and human nicotine pharmacokinetics (PK). **METHODS:** We developed five prototype reduced nicotine cigarettes (RNCs) with nicotine levels between 1.3 to 11.1 mg nicotine per gram tobacco and one prototype conventional nicotine cigarette (CNC). Using these prototypes, we conducted a randomized 6-way crossover clinical study to investigate nicotine PK among 56 healthy adult cigarette smokers following controlled use of a single cigarette (10 puffs taken at 30s intervals). The study also examined product use parameters and increase in blood carboxyhemoglobin saturation (CO boost) during 30 minutes of *ad libitum* product use. **RESULTS:** Both maximum plasma nicotine concentration (C_{max}) and area under the nicotine concentration curve (AUC) following the use of the RNC prototypes (1.34-7.08 ng/ml and 1.48-7.99 ng*hr/ml, respectively) were lower than with the CNC prototype (9.33 ng/ml and 10.39 ng*hr/ml, respectively). Overall, the average number of puffs, puff duration, number of cigarettes smoked during the brief *ad libitum* product use conditions, and cigarette butt length, were similar between the RNC and CNC prototypes. There was no significant difference in CO boost among the study cigarettes. **CONCLUSIONS:** Smokers' exposure to nicotine is closely correlated with the nicotine content of the study cigarettes. We found no significant differences in use parameters or CO boost when participants smoked the study cigarettes with different nicotine levels during 30 minutes of *ad libitum* use conditions. The lowest nicotine content (1.3 mg/g) tested in the study was higher than the level of particular interest to the FDA (0.3-0.5 mg/g). Tobacco leaf at lower nicotine levels was not available to make RNC prototypes in the 0.3-0.5 mg/g range.

FUNDING: Tobacco Industry

PS5-217

EVALUATION OF BIOMARKERS OF EXPOSURE IN ADULT CIGARETTE SMOKERS DURING DUAL USE OR EXCLUSIVE USE OF VERVE® DISCS AND CHEWS

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SIGNIFICANCE: Many adult smokers (AS) are interested in alternatives to traditional cigarettes. VERVE® Discs and Chews are non-dissolvable oral products that contain tobacco derived nicotine (~1.5mg per unit) without tobacco. The objective of this study was to evaluate the change in exposure in AS using a minimum of 3 VERVE® Discs

and Chews per day. **METHODS:** AS were randomized into the following groups - CS: subjects (n = 40) continue smoking their own brand; DDU: subjects (n =42) reduced their cigarettes by $\geq 50\%$ and used VERVE® Discs; CDU: subjects (n =41) reduced their cigarettes by $\geq 50\%$ and used VERVE® Chews; DSC subjects (n = 30) stopped smoking and used VERVE® Discs; CWS subjects (n = 30) stopped smoking and used Verve Chews; NT: subjects (n = 30) were not allowed to use tobacco products during the 7-day study. 20 biomarkers of exposure (BOE) were measured at baseline and Day 5 and Day 7 and included 24-hr urinary metabolites of tobacco specific nitrosamines, nicotine, aromatic amines, acrolein, benzene, polycyclic aromatic hydrocarbon; mutagenicity; and carboxyhemoglobin (blood). **RESULTS:** Cigarettes ranged from ~17-18 per day across the groups at baseline and CS smoked ~17 cigarettes on Day 7. On Day 7, VERVE® use ranged from ~ 5-6 per day with ~8-9 cigarettes per day, in the DDU and CDU groups, and ~8-10 VERVE® per day in the CWS and DSC groups. All biomarkers were lower in the DDU and CDU groups compared to CS, with statistically significant ($p < .05$) reductions in the majority BOEs at day 5 or 7. Even larger reductions were observed in the DSC and CWS groups compared to CS. In addition, for the DSC and CWS, no statistically significant differences were observed in any BOEs measured (except for nicotine) compared to the NT group. **CONCLUSION:** A $\geq 50\%$ reduction in cigarettes while using VERVE® products results in some exposure reductions, however, switching completely to VERVE® results in exposure reductions similar to no tobacco use (except for nicotine). VERVE® may offer cigarette smokers a non-combustible alternative to cigarettes and provide a potential product lower in the continuum of risk.

FUNDING: Tobacco Industry

PS5-218

LONGITUDINAL STUDY OF FACTORS ASSOCIATED WITH EXPERIMENTAL VS. PERSISTENT CIGARETTE SMOKING BEHAVIOR IN ADULT NON-ESTABLISHED SMOKERS (NES) WHO USED THE NICOTINE SALT POD SYSTEM (NSPS)

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OBJECTIVE: Use of the nicotine salt pod system (NSPS) has increased among adults. There is limited data on the patterns of smoking behavior among non-established smokers (NES) NSPS users. This study examined initiation of combustible cigarette smoking patterns over a 6-month period among new NSPS users who were NES. **METHODS:** We analyzed longitudinal survey data of U.S. adults (age 21 or older) who recently purchased a NSPS (JUUL Labs, Inc.) starter kit. NES were defined as subjects who had never smoked or smoked less than 100 cigarettes in their lifetime at baseline. To better understand NES behavior, we stratified NES into three subgroups: 1) never triers (never smoked a cigarette, not even a puff), 2) former triers (reported not smoking at baseline), and 3) current triers (reported smoking some days/every day at baseline). Follow-up assessments of past 30-day use of combustible cigarettes were completed at 30-, 60-, 90- and 180-days (N=3584). Persistent smoking was defined by at least two consecutive reports of smoking during follow-up; experimental use was defined as an isolated report of smoking. Multinomial logistic regression models were used to examine factors (Demographics and average JUUL use days) associated with smoking abstinence vs. experimental use vs. persistent smoking. **RESULTS:** Most NES were white (65.1%) males (59.3%) with the mean age of 25.9 (SD = 8.4) years. On average, at each assessment, the smoking rate was 6.8% for never triers, 18.8% for former triers and 40.6% for current triers. Smoking rates did not increase over time for any subgroup. Smoking was isolated to one follow-up for the majority of never triers (63.1%) and former triers (54.4%). Smoking at all follow-ups took was reported most frequently by current triers (33.2%). Never triers reported rates of 12.4% and 4.8% for experimental and persistent smoking, respectively; former triers and current triers reported rates of 26.1% and 15.7% and 22.9% and 40.4%, respectively. Multinomial logistic regressions did not reveal consistent factors. **CONCLUSIONS:** Initiation of combustible cigarette smoking was observed to be lowest in never triers compared to former and current triers.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-219

DIFFERENTIAL PERSON FUNCTION ANALYSIS OF THE MODIFIED CIGARETTE EVALUATION QUESTIONNAIRE

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Significance: The modified Cigarette Evaluation Questionnaire (mCEQ) assesses the subjective effects of cigarettes. Often, participants in a single study are asked to complete different "versions" of the mCEQ, whereby the mCEQ items are modified to



reference different tobacco product categories and scores from the different versions are directly compared. That approach assumes that tobacco product effects being measured by the mCEQ are equivalent across categories. **Methods:** In the current study, we address this assumption through differential person function (DPF) analyses using data from 345 adult participants in 5 clinical studies who completed more than one version of the mCEQ (cigarette (mCEQ), e-vapor ("mCEQ-E"), or nicotine replacement therapies ("mCEQ-N")). **Results:** First, results from factor analytic and Rasch modeling approaches supported the removal of an item from the Psychological Reward scale (reduce hunger) and supported combining two scales (Satisfaction and Sensations) as a single scale ("Satisfaction/Sensation") to improve validity of the questionnaire overall. Similar item difficulties were revealed across all three mCEQ versions, although the item hierarchies were not identical, supporting the need for DPF analyses. DPF analyses indicated that 9.3% and 17.7% of persons exhibited significant DPF for the Psychological Reward and Satisfaction/Sensations scales, respectively. For example, Satisfaction/Sensation items specifying cigarettes were easier to endorse than the same items specifying e-vapor or NRT, suggesting that scores on the mCEQ scale are not directly comparable to the mCEQ-E or mCEQ-N. **Conclusion:** Findings from this analysis indicate the need for differential scoring generated from Rasch models when comparing across product categories using different versions of the mCEQ. Researchers should use caution in drawing conclusions from studies that directly compare raw scores from the different mCEQ versions.

FUNDING: Tobacco Industry

PS5-220

HPHC MARKET MAP STUDIES FOR MACHINE MADE CIGARS PART 2 PREDICTIVE MODELS

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In May 2016, the U.S. Food and Drug Administration (FDA) issued a final rule to deem cigars to be subject to the Federal Food, Drug, and Cosmetic Act (the FD&C Act), as amended by the Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act). As part of this regulation, the FDA will require manufacturers to report the quantities of Harmful and Potentially Harmful Constituents (HPHCs) in cigar filler and smoke. However, there have been few, if any, thorough and rigorous studies of smoke and tobacco chemistry and physical properties of cigars. Market maps or benchmarking studies have been used in the cigarette industry for many years to aid in the characterization of the marketplace. Cigars, as a category, have been little-studied as compared to cigarettes. Market map studies provide comparative values and predictive models for aiding in the assessment of other marketplace products. This study examined cigar smoke yields, tobacco chemistry, and physical properties of 24 machine-made cigars from the US marketplace to develop marketplace predictive relationships to aid in the evaluation of machine-made cigars not included in this sample of products. Cigars show much greater variability in weight and resistance to draw than cigarettes and that variation is reflected in much greater smoke yield variability than is seen with cigarettes. Products were smoked using the CORESTA, ISO, and Health Canada Intense smoking regimes for all the constituents on the FDA abbreviated HPHC list for cigarettes. The cigars were also tested for each of the tobacco filler constituents on the FDA abbreviated HPHC list for cigarettes. The market map approach facilitates comparison of smoke yields within the broader market perspective rather than one-to-one cigar comparisons. Many of the smoke yield correlations are further improved by incorporating the tobacco characteristics into predictive models.

FUNDING: Tobacco Industry

PS5-221

HPHC MARKET MAP STUDY FOR US MACHINE-MADE CIGARS PART 1 DESCRIPTION OF PRODUCTS AND THE INHERENT VARIABILITY OF CIGARS

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In May 2016, the U.S. Food and Drug Administration (FDA) issued a final rule to deem cigars to be subject to the Federal Food, Drug, and Cosmetic Act (the FD&C Act), as amended by the Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act). As part of this regulation, the FDA will require manufacturers to report the quantities of Harmful and Potentially Harmful Constituents (HPHCs) in cigar filler and smoke. However, there lacks a thorough and rigorous study of smoke and tobacco chemistry and physical properties of cigars. Market maps or benchmarking studies have been used in the cigarette industry for many years to aid in the characterization of the marketplace.

Cigars, as a category, are little-studied as compared to cigarettes. Market map studies provide comparative values and predictive models for aiding in the assessment of other marketplace products. This study examined the smoke yields, tobacco chemistry, and physical properties of 24 machine-made cigars from the US marketplace. The goal was to establish HPHC ranges for smoke yields and tobacco chemistry and also to develop marketplace predictive relationships to aid in the evaluation of machine-made cigars not included in this sample of products. Products were smoked using the CORESTA, ISO, and Health Canada Intense smoking regimes for all of the constituents on the FDA abbreviated HPHC list for cigarettes. The cigars were also tested for each of the tobacco filler constituents on the FDA abbreviated HPHC list for cigarettes. Cigars show much greater variability in weight and resistance to draw than cigarettes and that variation is reflected in much greater smoke yield variability than is seen with cigarettes.

FUNDING: Tobacco Industry

PS5-222

NEXT GENERATION PRODUCTS INDUCE LOWER BIOLOGICAL ACTIVITY THAN COMBUSTED CIGARETTES USING BIOMAP SYSTEMS OF HUMAN PRIMARY CELL BASED COCULTURES

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Smoking is a cause of serious disease in smokers. While public health bodies recommend complete cessation, for those unable or unwilling to do so, some public health organisations have recognised the harm reduction potential of next generation products (NGPs). Due to rapid innovation in NGPs; human relevant, sensitive, reliable and quick preclinical toxicology assessment methods are required. We compared the biological response of three different NGP product aerosols to conventional cigarette smoke in 12 human primary cell cultures using BioMAP® Diversity PLUS *in vitro* panel. Our aim was to assess the potential effects of smoke and aerosols on multiple cell types and disease relevant endpoints. Products investigated were the Kentucky reference cigarette (3R4F), a tobacco heating product (THP), a hybrid product (HYB) and a *myblu*™ vapour product (1.6% [w/w] nicotine; tobacco flavour). The smoke/aerosols were generated using the Health Canada Intense smoking regime for 3R4F and THP (55mL/2s/30s) and the CORESTA Recommended Method N°81 (55mL/3s/30s; square wave puff profile) for HYB and *myblu*™. The whole smoke and aerosols were bubbled through impingers containing Phosphate Buffered Saline (PBS), generating stock solutions of 1.8 puffs per ml for cigarette and 4 puffs per ml for the NGPs. The 3R4F smoke PBS extracts were active in the BioMAP® Diversity PLUS panel with 20 significant read outs (of 148 total) in seven cell systems comprising venular endothelial cells; mononuclear cells with venular cells; B cells with mononuclear cells; coronary artery smooth muscle cells; dermal fibroblasts; lung fibroblasts and macrophages with endothelial cells. For all the NGP extracts, even at the highest concentrations tested, ≤ 4 biomarkers were significantly altered from the control value none of which were consistently altered across multiple cell systems. Using data mining methodology (Toxicity Signatures Analysis by Eurofins Discovery), 3R4F extract profile demonstrated activities associated with immunosuppression; skin irritation and thrombosis. The NGP extract profiles demonstrated no Toxicity Signature-associated activities.

FUNDING: E-cigarette/Alternative nicotine products Industry; Tobacco Industry

PS5-223

COMPARISON OF MONOAMINE OXIDASE INHIBITION BY CIGARETTES AND CANDIDATE MODIFIED RISK TOBACCO PRODUCTS

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The main strategy to diminish and prevent the adverse effects of cigarette smoking and the burdens of smoking-related diseases is to reduce smoking prevalence by preventing smoking initiation and promoting smoking cessation. More recently, a complementary avenue, Tobacco Harm Reduction, has emerged. To this end, candidate modified risk tobacco products (cMRTPs), such as e-cigarettes, Snus and heated tobacco products, have been developed. The cMRTPs deliver nicotine with significantly reduced levels of the toxicants that are emitted by combustible cigarettes, which ultimately reduce exposure to toxicants in smokers who switch completely to these products. However, concerns remain regarding their addictive potential. Smoking addiction is a complex phenomenon involving multiple pharmacological and non-pharmacological factors. Although the main pharmacological substance associated with smoking addiction is thought to be nicotine, which acts as a primary reinforcer, other factors are also reported



to be involved in the establishment of smoking addiction. In fact, the inhibition of monoamine oxidases (MAO), mammalian flavoenzymes with a central role in neurotransmitter metabolism, appears to be involved in this process. Therefore, we investigated several types of cMRTPs for their ability to inhibit MAO activities and compared them with 3R4F reference cigarettes using a human recombinant MAO enzymatic activity assay. The results indicated that the Tobacco Heating System 2.2 (THS 2.2), a heated tobacco product, and e-cigarettes (e.g., MESH) showed no MAO inhibitory activity, while 3R4F and Snus significantly inhibited MAO activity, in agreement with the previous analytical data for MAO inhibitors emitted by these products. In conclusion, we demonstrate here that specific cMRTPs, namely THS 2.2 and MESH, have significantly reduced MAO inhibitory activities compared with 3R4F. These findings provide a basis to further investigate both the role of MAO inhibitors in cigarette addiction and their implications for abuse liability of sMRTPs in comparison with conventional cigarettes.

FUNDING: Tobacco Industry

PS5-225

EFFECTS OF NICOTINE REPLACEMENT THERAPY ON BIOMARKERS OF EFFECTS AFTER 3 MONTHS OF CONTINUOUS SMOKING ABSTINENCE

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Smoking contributes to an elevated risk of smoking-related cardiovascular diseases via pathways such as inflammation and oxidative damage. Stopping smoking reverses this risk over time, which can be assessed by measuring changes in several biomarkers of effects (BoE) that are sensitive to change with smoking cessation. BoEs such as white blood cell (WBC) count or soluble intercellular adhesion molecule-1 (sICAM-1) - indicators of inflammation and endothelial dysfunction, respectively - have been shown to decrease after smoking cessation. Nicotine replacement therapy (NRT) is a well-established and successful therapy for increasing the probability of quitting smoking and supporting long-term abstinence. Literature also shows that NRT reduces cardiovascular risk in former smokers (relative to current smokers), without any significant adverse health consequences. We investigated the reversibility of smoking-related harm after a 1-year period of continuous smoking cessation in adult healthy smokers in a prospective, multicenter, multiregional (USA, Europe, and Japan) study by assessing a set of BoEs covering major multiple pathways involved in the onset or progression of smoking-related diseases. Here, the use of all NRT products (as per label in the country) was allowed for up to 3 months upon request by the study participants. This exploratory analysis was performed to gain a better understanding of the effects of NRT, particularly in connection with further confounders such as sex or lifestyle (including diet and exercise), on selected BoEs associated with cardiovascular diseases and on vital signs during the 3 months of continuous smoking abstinence. Upon comparing subjects who did and did not use NRT as a smoking aid, the results showed that nicotine provided by NRT itself has no effect on most of the selected BoEs or vital signs. Confounding factors such as sex and lifestyle in the respective regions seem to have some effects on the magnitude of changes in these BoEs. One limitation of the present analysis is the variability of data due to the limited numbers of subjects in the study populations.

FUNDING: Tobacco Industry

PS5-226

ANXIOLYTIC LIKE EFFECTS OF NICOTINE AND OTHER MINOR TOBACCO ALKALOIDS IN ZEBRAFISH

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Smoking has been repeatedly demonstrated to have anxiolytic and antidepressant effects in smokers, which is thought to contribute to the reinforcing effect of smoking addiction. There are more than 8,000 constituents in cigarette smoke. To understand which of the tobacco components could have these psychoactive properties, we investigated the anxiolytic effects of selected tobacco alkaloids by using the zebrafish novel tank test. This behavioral paradigm has higher throughput compared to rodent tests, taking advantage of the fact that zebrafish have the tendency to dive and dwell at the bottom of a body of water to avoid danger or stress. Many anxiolytic drugs, such as diazepam and buspirone, have been shown to reduce this anxiety-driven behavior. Using this model, we found that nicotine, cotinine, anatabine, and harmaline induce anxiolytic-like effects in a dose-dependent manner. To understand the possible mechanisms underlying this effect, we extensively investigated the molecular targets of these alkaloids *in vitro*. The results indicated that nicotine, cotinine, and anatabine show binding selectivity to subtypes of nicotinic acetylcholine receptors (nAChR) among more than 170 targets.

The functional activity of the compounds on these receptors was confirmed electrophysiologically. Harmaline, however, bound to multiple potential binding targets, in addition to its well-documented effect on monoamine oxidase (MAO). Taken together, these results indicate that, in addition to nicotine, there are other tobacco alkaloids that may possess anxiolytic-like properties, the mechanisms of which are mostly likely mediated by nAChRs, MAO, and potentially other molecules. Further investigations are necessary to elucidate the exact mechanisms.

FUNDING: E-cigarette/Alternative nicotine products Industry; Tobacco Industry

PS5-227

NICOTINE DEPENDENCE AND URGE TO SMOKE IN IQOS USERS COMPARED TO CIGARETTE SMOKERS-BASELINE RESULTS IN A REAL-WORLD SAMPLE

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Background Substitution of tobacco products for less harmful products is an important harm reduction strategy to reduce individual risk and population harm. The aerosol generated by IQOS, a novel smoke free product, has substantially fewer toxicants than cigarette (CC) smoke. To assess the potential health benefit of a novel product, it is also important to understand potential abuse liability of the product. Our clinical studies have shown no difference in the Fagerström Test for Nicotine Dependence (FTND) total score between IQOS users and CC smokers. After 90 days of IQOS use, the suppression of urge to smoke was similar to that in CC smokers. The present real-world study assessed nicotine dependence and urge to smoke in IQOS users. **Objectives** To compare nicotine dependence and urge to smoke in IQOS users and CC smokers in real-world conditions by using baseline data from a longitudinal study. **Methods** A cohort study in Japan was designed to assess product-use patterns in IQOS users and CC smokers. At baseline, nicotine dependence and urge to smoke were assessed with the FTND and Questionnaire on Smoking Urges-brief version (QSU-b), respectively. Exploratory analyses were conducted to evaluate the FTND and QSU-b total scores in exclusive IQOS users, dual IQOS-CC users, and exclusive CC smokers. Tobacco product consumption was self-reported. **Results** Data were obtained from 778 participants at baseline: 226 exclusive IQOS users, 173 dual IQOS-CC users, and 379 exclusive CC smokers. The mean FTND total scores for these groups were 4.2 (95% CI: 4.0-4.5), 4.4 (95% CI: 4.0-4.7), and 4.2 (95% CI: 4.0-4.4), and the mean QSU-b total scores were 29.8 (95% CI: 28.3-31.4), 33.4 (95% CI: 31.5-35.3), and 33.1 (95% CI: 31.7-34.5), respectively. In all three groups, the level of nicotine dependence and urge to smoke increased with the number of products consumed per day. **Conclusions** This exploratory real-world analysis confirms previous clinical findings and suggests that IQOS use does not increase nicotine dependence or the urge to smoke relative to cigarette smoke.

FUNDING: Unfunded; Tobacco Industry

PS5-228

REAL-TIME ANALYSIS OF PARTICLE SIZE DISTRIBUTION OF ENDS PRODUCTS USING A NOVEL ELECTRONIC LOW-PRESSURE IMPACTOR

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Significance Particle sizing for tobacco products, including electronic nicotine delivery systems (ENDS), relies on optical techniques or cascade impactors, which are time-consuming, prone to sample loss, and have high variabilities in mass median aerodynamic diameters (MMADs). This study used an electronic low-pressure impactor (ELPI+) to obtain real-time particle size and concentrations of aerosols emitted from ENDS products. We used this instrument to study how MMAD varies with ENDS formulation, temperature, and wicking material. **Methods** A Borgwaldt smoking machine was programmed with puffing profiles ranging from standard CORESTA recommended method 81 (55 mL puff volume over 3 s with 30 s in between puffs) to custom profiles (110 mL puff volume over 6 s with 30 s in between puffs). A side stream of the aerosol entered a two-stage dilution system before entering the ELPI+. Data were analyzed in real time to determine particle size, as well as mass or number concentrations of the particles, as a function of ENDS product on a puff-by-puff basis. **Results** We validated the ELPI+ by comparing to ISO-certified standard techniques and testing the variation of particle size by different factors, such as coil temperature, formulation, viscosity, wicking material, and ENDS device. An average MMAD of 0.9 microns of the same ENDS formulation was measured using both the ELPI+ and a Mini-MOUDI impactor, suggesting the instrument yields similar results as traditional instruments. Increased temperature of the



heating coil in the device resulted in the MMAD of the aerosols increasing up to 70%. Different wicking materials produced aerosols with a 25% variation in MMAD. Different ratios of the carriers (propylene glycol/vegetable glycerin) in the formulation resulted in varying MMADs. These results show that the MMAD depends on various factors, such as temperature, wick style, and formulation. **Conclusions** This study demonstrated the robustness of an online particle sizer for real-time puff-by-puff analysis of ENDS products. Comparing the ELPI+ to traditional instruments, and measuring across different ENDS products, demonstrates that the online method of particle sizing has the potential to be an improvement compared to current measurement techniques with respect to time resolution and variabilities in MMAD with puff. Further analysis is needed to validate this method across ENDS devices and e-liquids.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-229

INITIAL FINDINGS FROM A PILOT PROGRAM OF A NOVEL SYSTEM TO IMPROVE RETAILER COMPLIANCE FOR TOBACCO PRODUCT PURCHASES

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SIGNIFICANCE: As part of youth-prevention initiatives, JUUL Labs is developing a set of stringent standards for sales of age-restricted JUUL products sold by point-of-sale (POS) systems in physical retail locations. These standards seek to automate transactions from beginning-to end, structurally mandate age verification, and limit quantity of JUUL products purchased in a transaction. The purpose of these standards is to reduce direct underage access to product and to prevent social sourcing/straw purchases. A pilot of these standards, referred to as Retail Access Control Standards (RACS), was conducted to understand the effectiveness of this system. **METHODS:** The RACS pilot was conducted from May - June 2019 in three retail chains selling tobacco products across distinct metropolitan areas in Pennsylvania, North Carolina and South Carolina. Employees at participating chains were trained to comply with RACS requirements. In total, 3,990 "secret shop" audits at 171 participating stores were conducted prior to launch and following implementation of RACS protocol. Audit failure rates were compared overall, by chain, location and failure type (age verification [AV] vs. bulk purchase [BP]). Paired t-tests determined if there were significant differences in failure rates pre- and post-implementation. **RESULTS:** Prior to implementing RACS, the overall audit failure rate was 36.8% for meeting AV standards, and 29.3% for meeting BP standards for JUUL purchases. Following the pilot, these rates reduced to 0.2% and 1.0% respectively, a statistically significant decrease ($p < 0.01$). AV failure rates prior to RACS ($N = 1,115$ audits) ranged from 26.1% to 51.4% across each of the chains and reduced to 0.0 - 0.3% in the post period. Similarly, BP failure rates ranged from 10.3% to 53.2% in the pre period across chains ($N = 1,104$ audits) and decreased to 0.0 - 2.7% in the post period. All reductions were statistically significant ($p < 0.01$). T-tests across stratified samples found significant differences in rate of reduction in failure rates across chains and states ($p < 0.01$). AV failure rates in the post period were also lower than the 13.5% past-year national failure rate for tobacco product purchases reported by the FDA for U.S. retailers. **CONCLUSIONS:** This pilot provides compelling preliminary evidence of retail-level tobacco control measures that improve compliance and prevent youth access in retail. Further evaluation is needed to understand factors that impact long-term success of RACS.

FUNDING: E-cigarette/Alternative nicotine products Industry

PS5-230

NICOTINE AND TOXICANT EXPOSURE AMONG CIGARETTE SMOKERS WHO TRANSITION TO QUITTING, EXCLUSIVE USE OF E-VAPOR, OR DUAL USE WITH E-VAPOR PRODUCTS

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Significance: Changes in tobacco use behaviors may impact exposure to nicotine and other smoke constituents. Using PATH data, we evaluated changes in urinary biomarkers of exposure among adult exclusive smokers (AES) who transitioned to e-vapor products (EVP) use or stopped smoking (SS). **Methods:** We analyzed 18 urinary biomarkers of exposure to nicotine and other smoke constituents in 2,487 Wave 1 AES. By Wave 2, these AES had either SS, transitioned to exclusive use of EVP (EEVP), began dual using cigarettes and EVP (DU), or remained AES. Wave 1 to Wave 2 changes in biomarker levels of SS, EEVP, DU were compared to the changes in those that remained AES at Wave 2. The transition from smoking to DU was further explored to understand the impact of frequent (smoke on ≥ 20 days), or infrequent

(≤ 19 days) smoking on biomarker levels of DU. Changes in the geometric mean of biomarkers were controlled for key demographics, BMI, and region. Dual use analysis was segmented for frequent or infrequent smoking at Wave 2 and controlled for use at Wave 1. **Results:** At Wave 2, 9% of Wave 1 AES stopped smoking, 1% switched to exclusive e-vapor, 9% were DU, 73% remained AES, and 8% other. AES who stopped smoking had significant reductions ($p < .05$) in 14 of 18 biomarkers compared to those that remained AES. AES who transitioned to EEVP use had significant reductions in 16 of 18 biomarkers compared to those that remained AES. AES who began dual use with e-vapor had significant reductions in 5 of 18 biomarkers. Among the DU, DU who smoked infrequently had significant reductions in 6 of 18 biomarkers compared to DU who smoked frequently. Other biomarker levels fluctuated (up or down) but did not reach statistical significance. **Conclusion:** AES who stopped smoking or switched to e-vapor had generally lower levels of biomarkers. DU who smoke infrequently had some lower biomarker levels than DU who smoked frequently. These results suggest that in DU, biomarker levels are driven by frequency of cigarette smoking and not all DU are the same. While quitting or complete switching is the optimum outcome, reduction in cigarette consumption reduces exposure to some cigarette constituents.

FUNDING: Tobacco Industry

PS5-231

NOT ALL DUAL USE OF CIGARETTES AND E-VAPOR PRODUCTS IS THE SAME: BIOMARKERS AND TOBACCO USE BEHAVIOR IN SUBPOPULATIONS OF DUAL USERS FROM THE PATH WAVE 1 DATA

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Significance: Dual users (DU) of cigarettes (CIG) and e-vapor products (EVP) are often considered a single group. We assessed biomarkers of exposure (BoE) to HPHCs and biomarkers of potential harm (BoPH) to better understand levels of exposure among these subgroups. **Methods:** We segmented DU ($n=970$) in the PATH Study Wave 1 (2013-2014) into four major subgroups based on the number of days they had used each product in past 30 days - Frequent DU of both products (use each product ≥ 20 days), Smokers who Vape (smoke on ≥ 20 days, vape on ≤ 19 days), Vapers who Smoke (vape on ≥ 20 days, smoke on ≤ 19 days), and Infrequent DU of both products (use each product on ≤ 19 days). Biological samples were analyzed for BoEs including tobacco specific nitrosamines (NNAL, NNN), nicotine (TNE-7), cadmium, lead, 2-hydroxyfluorene, 3-hydroxyfluorene, pyrene (1-hydroxypyrene), eight mercapturic acid metabolites of gas-phase HPHCs. We also analyzed BoPHs, including high-sensitivity c-reactive protein (hs-CRP), interleukin-6 (IL-6), soluble intercellular adhesion molecule (sICAM) and fibrinogen. The statistical comparisons were made within DU groups and versus exclusive daily CIG smokers ($n=2442$). **Results:** The proportions in each subgroup were: Smokers who Vape ($n=678$; 69.2%); Frequent DU ($n=169$; 18.1%); Infrequent DU ($n=66$; 6.9%) and Vapers who Smoke ($n=57$; 5.8%). Within the DU groups, Smokers who Vape group showed statistically significant ($p < 0.05$) higher levels of 9/18 BoEs compared to Frequent DU. Vapers who Smoke and Infrequent DU showed statistically significant lower levels of 17/18 BoEs than Smokers Who Vape and Frequent DU. Infrequent DU had the lowest biomarker levels among all DUs. Both Vapers Who Smoke and Infrequent DU groups exhibited significantly lower levels of 14/18 and 15/18 BoEs as well as the BoPHs IL6 and sICAM compared to exclusive CIG smokers, respectively. **Conclusions:** Biomarker levels in DU overall are driven by frequency of cigarette smoking and not by frequency of e-cigarette use suggesting not all dual users are the same.

FUNDING: Tobacco Industry

PS5-232

RATES AND PREDICTORS OF PAST 30-DAY ABSTINENCE FROM CIGARETTE SMOKING IN A LARGE COHORT OF ADULT ESTABLISHED SMOKERS WHO USED A JUUL VAPORIZER FOR TWELVE MONTHS

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Background: JUUL is the fastest growing and highest selling brand of e-cigarette/vapor products in the United States. Assessing the effect of JUUL vapor products on adult smokers' use of conventional tobacco cigarettes can help inform the potential population health impact of these products. **Methods:** Participants were 15,456 adult established current smokers in the United States recruited at the point of their first purchase of a JUUL Starter Kit from a retail or e-commerce store. Online surveys



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assessed past 30-day use of conventional cigarettes, JUUL vapor products, and other vaping products at 3, 6 and 12 months after smokers' first JUUL purchase. Logistic regression models examined factors associated with smokers' odds of self-reporting past 30-day abstinence from cigarette smoking at 12 months. **Results:** Past 30-day point prevalence abstinence from cigarette smoking at 12 months was 32.3% in the intent-to-treat (ITT) sample, and 58.6% among respondents to the 12-months survey (n = 8,511; 55.1% of ITT). Consecutive past 30-day smoking abstinence outcomes at 3, 6 and 12 months were reported by 15.1% of the ITT sample and 39.1% of respondents to all three assessments (n = 5,963). Covariate-adjusted odds for reporting past 30-day smoking abstinence at 12 months were significantly higher among past 30-day primary users of Mint or Mango flavored JUULpods; exclusive users of JUULpods in characterizing flavors; daily users of the JUUL vaporizer; and among smokers who first purchased a JUUL to help to quit smoking completely. Odds for reporting past 30-day smoking abstinence were significantly lower those who, at study enrolment, had smoked regularly for ≥ 20 years, were smoking ≥ 10 cigarettes per day, and smoked cigarettes on all 30 of the previous 30 days. **Conclusions:** Around 15% of a large cohort of adult new users of a JUUL vaporizer were past 30-day abstinent from cigarette smoking at 3, 6 and 12 months after their first JUUL purchase. Daily use of a JUUL vaporizer and primary use of JUULpods in characterizing flavors, particularly Mint and Mango, appeared to be important to adult smokers' chances of having completely switched to using a JUUL at 12 months.

FUNDING: E-cigarette/Alternative nicotine products Industry

could be overcome with a method that allows collection of the PP and GVP together in a solvent with enhanced trapping and stability of GVP components. We evaluated the use of ethanol to collect PP and GVP components together and compared it against the traditional HC collection using the NRU, Ames, and MN assays all following HC guidelines. Reference 3R4F cigarettes were used to generate extracts which were evaluated at T0 and at 1-month. In the NRU assay, PP+GVP-ethanol showed higher toxicity (IC50 58.2 $\mu\text{g/mL}$) compared to PP-DMSO (IC50 87.6 $\mu\text{g/mL}$) or PP-DMSO+GVP-PBS (IC50 110.3 $\mu\text{g/mL}$) collected under HC guidelines. In the Ames assay, PP+GVP-ethanol resulted in increased bacterial lawn cytotoxicity in TA98, TA100, TA1535 and TA1537. With metabolic activation, PP+GVP-ethanol induced an 18-fold and 11-fold increase in the number of revertants in TA98 and TA1537 respectively while, PP-DMSO induced a 16-fold and 8-fold increase, and PP-DMSO+GVP-PBS induced a 14-fold and 6-fold increase in the same strains. Dose dependent increases in MN were observed in all three types of extracts (PP+GVP-ethanol, PP-DMSO or PP-DMSO+GVP-PBS). Without metabolic activation, PP-DMSO, PP-DMSO+GVP-PBS or PP+GVP-ethanol exposure resulted in a mean fold MN increase in a dose dependent manner from 1.0 to 5.0x for all three extract types. With metabolic activation, PP-DMSO and PP-DMSO+GVP-PBS exposure resulted in a mean fold MN increase from 1.0 to 5.0x while PP+GVP-ethanol resulted in 1.0 to 3.7x fold MN increase. No significant differences were observed in 1-month old frozen PP+GVP-ethanol extracts as compared to fresh samples. The method described here allows for trapping of PP+GVP yielding a single whole-smoke extract with increased stability and comparable or higher response than the HC method.

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PS5-233

ASSOCIATED RISK PERCEPTION OF E-VAPOR AND T-VAPOR PRODUCTS AMONG SMOKERS AND NON-SMOKERS IN THE UK

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Significance - Tobacco companies are increasingly interested in whether their marketing efforts will have the appropriate impact on consumer understanding and perception of reduce risks claims, in particular for smokers who switch to e-cigarettes. This research study contributes to this limited knowledge base by qualitatively examining perceptions of potential risk/health messages for two types of e-cigarettes: electronic cigarettes (E-Vapor) and tobacco cigarettes (T-Vapor). The goal of the study was to inform whether message/disclaimers about tobacco and e-liquid vapor products are understandable and do not mislead consumers into believing these products are risk-free. Methods - Twelve focus groups occurred in early 2019, across the UK, with adult current cigarette users without intention to quit, current cigarette users with intention to quit, former smokers and non-smokers. Participants rated and subsequently discussed their perceptions of six e-cigarette warning messages and associated disclaimer statements; to potentially be included on E-Vapor and T-Vapor packaging. Results - All user types provided constructive feedback on proposed messages and corresponding disclaimers. A major theme of the findings was that the presented statements were not perceived as being specific enough about the risks. Most desired more information around scientific evidence, research and other hard facts as either part of the message/warning itself or as an enclosed product leaflet; to improve the effectiveness of the messaging. Participants also wanted references to actual ingredients and toxins included (with levels) and to specific health effects; for both products but especially as it relates to T-Vapor which contains tobacco. Conclusion - According to these findings, the research shall continue and be followed by a robust quantitative study to investigate several but more specific type of messaging that would optimize consumer understanding and perception rating of claims in UK.

FUNDING: E-cigarette/Alternative nicotine products Industry; Tobacco Industry

PS5-234

IN VITRO AND STABILITY TESTING OF AN ETHANOL COLLECTION METHOD COMBINING PARTICULATE AND GAS-VAPOR PHASE COMPONENTS FROM CIGARETTE SMOKE

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Health Canada (HC) guidelines require the collection and testing of the tobacco smoke as the particulate phase (PP), the gas-vapor phase (GVP), and a combination of both (PP+GVP). PP is extracted in DMSO while GVP is collected in PBS. This method has limitations since smoke is artificially collected as two separate fractions based on trapped method. A further limitation is GVP is collected in PBS which has limited trapping capacity for volatile and non-water-soluble compounds and also limited stability. These limitations



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