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SRNT 2021 ANNUAL
MEETING

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ENTIRELY VIRTUAL

ABSTRACTS

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**2021 SYMPOSIA****SYM1A****COMMUNITY-BASED MEDIA CAMPAIGNS AND INTERVENTIONS TARGETING SOCIOECONOMICALLY DISADVANTAGED AFRICAN-AMERICAN MEN**

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

The Louisiana Campaign for Tobacco-Free Living (TFL) created the African-American Male Cessation Initiative as one of the first campaigns to directly target low socioeconomically, disadvantaged African-American men in efforts to educate on the dangers of tobacco use, promote available cessation resources, and make the ask to quit. The campaign was created based on higher smoking rates among African-American men. According to the Behavioral Risk Factor Surveillance System (BRFSS) (2011-2017), smoking prevalence among African-American men in LA consistently remained higher than other demographic subgroups; and among those of low-SES status. Additionally, data from the Louisiana Tobacco Quitline (2011-2017) reflected the lowest call volume. These alarming statistics directly reflected the lack of a marketing campaign and an educational/outreach program targeting African-American men regarding the dangers of tobacco use and available cessation resources. There were twelve focus groups conducted in six Louisiana markets that represented greater than 25% African-American populations. Each market consisted of two groups – former and current smokers. Results from the focus groups indicated 1) limited availability of tobacco cessation resources available, 2) low recall of any quit smoking campaigns, and 3) had a desire to quit smoking. The most unique finding was each focus group reported that the focus groups sessions provided an opportunity to discuss their association with tobacco with men who resemble them; thus, the encounter was therapeutic and authentic. TFL enlisted a media and communication firm with a niche for designing campaigns targeting African-American males in disadvantaged communities to develop a campaign. The media campaign elements incorporated education, outreach, and free quit resources. As a result, the campaign resulted in high recall rates of the Louisiana Tobacco Quitline from the targeted demographic, increased call volume among African-American men to the Quitline and decreased smoking rates declined by 10 percent.

FUNDING: Unfunded

SYM1B**DESIGNING CULTURALLY TAILORED TOBACCO COUNTER-MARKETING FOR YOUNG ADULT CISGENDER SEXUAL MINORITY WOMEN TO MEET THE NEEDS OF THE COMMUNITY**

Ashley Sanders-Jackson, PhD. Michigan State University.

Significance. Young adult cisgender sexual minority women (SMW) are 4.8 times more likely to smoke cigarettes than heterosexual women. We describe a community-engaged research process to design tobacco counter-marketing messages that appeal to young adult cisgender SMW based on rapid-cycle feedback among community organization partners and a pilot pre-test study among this population. Methods. We used a multi-step process to create messages to appeal to young adult cisgender SMW using mixed methods. First, we extracted the central arguments from anti-smoking messages from a variety of sources including *Trinket's* and *Trash*, the Stanford Research into the Impact of Tobacco Advertising, the Centers for Disease Control Archive, and the American Legacy Foundation Archive. In total, we reviewed 1,829 unique messages containing 825 arguments. Our team (including a former ad agency copywriter) created text to provide to our external advisory board members from LGBTQ organizations for written feedback on each argument. We incorporated their feedback to select and edit the 34 messages for an argument strength rating study among SMW ages 18-30 (n=269; 137 nonsmokers and 132 smokers). We will utilize this data to refine arguments and create professional quality anti-smoking messages. Results. Our qualitative and quantitative results suggested the messages that were too heavily geared toward the LGBTQ community increased a sense of being targeted (e.g. use of a term like *queer*). It was difficult to produce arguments about the community directly without producing negative qualitative feedback and low message ratings. However, positive messages about the impact of smoking cessation, anti-industry messages that were not LGBTQ-centered and a general message that elicited pride were successful. Conclusions. Our mixed methods, community engaged research approach allowed us to understand message responses more fully. We believe that engaging in robust, rapid, conversation surround

processes that can be used to create messages may help the tobacco control community move toward the creation of replicable interventions that can be modified and applied across larger populations.

FUNDING: Federal

SYM1C**ENGAGING LOW SOCIOECONOMIC STATUS SURVIVORS OF CERVICAL CANCER IN PERSONALLY TAILORED TOBACCO TREATMENT**

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The national prevalence of smoking among cervical cancer survivors approaches 50%. Thus, survivorship care planning should include tobacco treatment designed to address the specific needs of this population. Data are from an ongoing RCT evaluating the efficacy of a novel smoking cessation intervention tailored to cervical cancer survivors. Motivation and Problem-Solving (MAPS) is a theoretically- and empirically-based approach to facilitating smoking cessation. This presentation focuses on recruitment, engagement and retention. Participants (n=202) were randomized to Standard Treatment (ST; n=100) or MAPS+ST (n=102). ST is mailed at baseline, 6 and 12 months and consists of a quitline referral, free NRT when ready to quit, and standard self-help materials. MAPS comprises ST + 6 proactive counseling calls over 12 months. Recruitment was more challenging than anticipated. Our initial clinic-based approach yielded only 64 participants over 18 months. Subsequent recruitment via Facebook resulted in substantially improved accrual. We partnered with two advertising agencies to target states with high rates of both cervical cancer and smoking. Participants had a mean age of 48 years, were predominantly non-Hispanic white (75%) and generally low-SES (41% had an annual household income <\$20,000 and 37% had = a high school education/GED). Participants had a mean smoking history of 29 years, 42% smoked within 5 minutes of waking, and mean CPD was 15, reflecting a high level of nicotine dependence. Cervical cancer stage varied: 42% had carcinoma in situ, 33% stage I, 12% stage II, 10% stage III and 3% stage IV. 14% preparing to start treatment, 12% in treatment and 74% post-treatment. Despite difficulty recruiting, retention is high (90% at 3 months, 88% at 6 months, 87% at 12 months and 81% at 18 months). Engagement in MAPS counseling is also strong, with 93.2% completing between 4 and 6 calls. Preliminary analyses suggest a strong linear association between the proportion of MAPS calls completed and smoking abstinence. Findings are encouraging and provide preliminary support for the utility of MAPS in engaging and retaining cervical cancer survivors in tobacco treatment.

FUNDING: Federal

SYM1D**RESEARCHER DIRECTED RECOMMENDATIONS FOR COLLABORATING WITH AMERICAN INDIAN TRIBES/ COMMUNITIES TO ACHIEVE SMOKING-RELATED HEALTH EQUITY**

Dana Mowis Carroll, PHD, MPH, BS. University of Minnesota.

American Indians (AI) residing in the northern plains region of the U.S. experience some of the most extreme smoking disparities. In some cases, AIs have suffered from abuse from outside researchers conducting studies and evaluations in their communities. Community-driven research that is feasible and culturally appropriate and conducted in a collaborative, transparent, and respectful manner is a necessary step towards achieving health equity for AIs. Based on our lessons learned collaborating together on various projects focused on reducing commercial tobacco use in AI tribes/communities, we propose multiple recommendations that may be helpful to researchers that are interested in or already embarking upon collaborations with AI tribes/communities. Recommendations include: Understand the nations you will work with and their governance structure (recognize that each of the federally recognized tribal communities is its own sovereign nation that may operate differently from neighboring tribes); build



trust with the community by learning about the tribe's history of involvement in research, spending time in the community (with tribal permission), and engaging community stakeholders throughout the entirety of the research process; exercise the life-long pursuit of becoming culturally attuned by practicing cultural humility; be straightforward with expectations and ideal communication strategies; develop a research agreement to define the study goals, intended outcomes, responsibilities of each collaborator, and a plan for using and safeguarding data; recognize that not all tribal communities have IRB's. Sometimes separate committees or tribal councils are designated to review for ethical, cultural, and feasibility considerations; provide resources to support the study and hire study personnel from within the community; strike a balance between providing tangible benefits to the community and gaining scientific knowledge; and treat collaborations as lifelong commitments. Collectively, our lessons learned and recommendations will aid tobacco and nicotine researchers in conducting collaborative, transparent, and respectful research with AI tribes/communities.

FUNDING: Federal

SYM1E

TWO TOBACCO WAYS: BUILDING A TRADITIONAL TOBACCO MOVEMENT IN MINNESOTA

Wyatt Pickner, MPH. American Indian Cancer Foundation.

Commercial tobacco disparities continue to exist for American Indian (AI) communities. 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 a traditional tobacco movement including education, policy and media campaigns 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 AIs. The Tribal Tobacco Use Project (TTUP) is a native-led prevalence study of commercial and traditional tobacco use among AI adults. TTUP is the first reliable statewide AI adult tobacco prevalence study in the U.S. The first TTUP took place 2008-2013. Tribal Tobacco Use Project Report, 2013 Findings from Minnesota AI Communities was shared with tribal councils, health directors, stakeholders and community members. The report's main finding was the 59% smoking prevalence among this population, which is 4 times the statewide population's rate. Multimillion dollar investments were made by tribes and public health organizations to address the staggering 59% smoking rate for Minnesota AIs. Variety of tobacco plans were developed by tribal tobacco coordinators that were rooted in culture and community-led. Now, the American Indian Cancer Foundation is implementing the second round of TTUP. Data collection began in 2019 and is expected to be complete in 2021. The Tribal Tobacco Education and Policy (TTEP) initiative was funded from 2008-2018. The purpose of this initiative was to provide resources and assistance to six tribal Nations to address commercial tobacco through policy and advocacy approaches. The goals of TTEP were to educate AIs about the health dangers of commercial tobacco use and secondhand smoke; and to advance commercial tobacco-free policies on tribal lands. During these ten years, over fifty policies were passed within these Tribal Nations.

FUNDING: State

SYM2A

SMOKING CESSATION SELF-HELP FOR DUAL USERS OF TOBACCO CIGARETTES AND E-CIGARETTES: PRIMARY OUTCOMES OF AN RCT

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Although many smokers begin using e-cigarettes to quit smoking, most continue to smoke. This "dual use" may delay smoking cessation and increase toxicant exposure. We, therefore, tested the efficacy of a self-help intervention to help dual users utilize their e-cigarettes to quit smoking. In this three-arm RCT we recruited individuals smoking at least weekly for the past year and vaping at least weekly over the past month. Participants were randomized to: assessment only (n = 575); generic smoking cessation self-help booklets previously shown to be efficacious in smokers (n = 1154); or booklets specifically targeted for dual users (n = 1167), which were adapted from the generic booklets based on qualitative research with dual users as well as the empirical NRT literature. Individuals in the latter two arms received monthly cessation materials for 18 months, with assessments occurring every three months for 24 months. The main outcome

was 7-day point-prevalence smoking abstinence at each assessment point. Smoking abstinence increased from 14% at 3 months to 37% at 18 months. Targeted self-help produced consistently higher smoking abstinence than assessment only throughout treatment (AOR = 1.56, 95% CI 1.14-2.12, P = .008), with the generic arm falling between the others. Moderator analyses revealed stronger treatment effects among cigarette-dependent smokers (FTND = 2), with abstinence rates in the targeted arm 6-8 percentage points higher than assessment only (AOR = 2.02, 95% CI 1.34-3.06, P < .001). Differences attenuated after the intervention ended. Cost/quitler upon treatment completion was \$1000 and \$1535 for targeted and generic self-help, respectively, with greater cost-effectiveness among dependent smokers. This study demonstrated that a low-cost, easily-disseminated intervention increased smoking abstinence over 18 months, with stronger treatment effects predicted by higher baseline levels of cigarette dependence. Findings expand the target of smoking cessation interventions involving e-cigarettes to encompass those who have already initiated vaping, including individuals who may have settled into a prolonged pattern of dual use.

FUNDING: Federal

SYM2B

PREDICTORS OF RETENTION IN A RANDOMIZED CONTROLLED TRIAL OF AN ELECTRONIC NICOTINE DELIVERY SYSTEM AMONG SMOKERS INTERESTED IN REDUCTION

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Mitigating attrition is a key component to reduce bias in longitudinal randomized controlled trials (RCTs). Few studies of electronic nicotine delivery systems (ENDS) allow for the examination of long-term retention. This analysis explores reasons for withdrawal (WD) and the relationship between retention, baseline measures, and condition assigned in an ENDS RCT with a 24-week intervention. Participants (N=520) were current smokers (=>10 cigarettes per day [CPD] for >=1 year) interested in reducing but not quitting and were randomized to 1 of 4 conditions: an ENDS containing 0, 8, or 36 mg/ml nicotine concentration liquid (administered double-blind) or a cigarette-shaped plastic tube (CIG SUB). Bivariate tests and logistic regression were used to examine predictors of retention status (completed vs. withdrawn during intervention). Predictors included baseline measures (demographics, tobacco use behaviors, and psychosocial/physiological variables), condition assigned, and study site with alpha set at 0.05. On average (SD), participants were 46 (12) years old, 41% male, 67% White, 33% Black/Other, and smoked 19 (8) CPD. Retention over 24 weeks did not differ significantly by condition (total withdrawn=188/520). The proportion of individuals specifically lost to follow-up (no show to 3 consecutive visits) also did not differ significantly by condition (124/188). At the bivariate level, younger age, less education, earlier age of smoking initiation, greater cigarette nicotine dependence (ND), and higher pulmonary forced vital capacity (FVC) were associated with WD. When these factors and condition assigned were entered into a regression, only younger age and greater ND emerged as significant predictors of WD. When regressions were stratified by condition, predictors significantly associated with WD differed with younger age and less education positively associated for CIG SUB, greater ND and FVC positively associated for ENDS+0 mg/ml, and no significant baseline predictors of WD for ENDS+8 or 36 mg/ml. Findings suggest differences in nicotine delivery between conditions might influence retention patterns and highlight subgroups for targeted retention efforts.

FUNDING: Federal

SYM2C

CIGARETTE NICOTINE REDUCTION IN THE PRESENCE OF AN ALTERNATIVE: INVESTIGATING HOW CIGARETTE NICOTINE CONTENT AND E-LIQUID NICOTINE CONTENT AFFECT SMOKING

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SIGNIFICANCE: Evidence from randomized controlled trials suggests reducing nicotine content in cigarettes decreases smoking and biomarkers of exposure, however these effects may interact with the availability and use of alternative nicotine products in ways not yet examined. In this study, participants received cigarettes and vaping supplies concurrently to test the impact of cigarette nicotine content and e-liquid nicotine content, and e-liquid flavor availability on product use. METHODS: Daily smokers were



randomized to experimental groups within a 2 x 2 x 2 design. All participants received study cigarettes and a vape pen with e-liquid to use for 12 weeks. Cigarette nicotine content was either very low (0.4mg/g of tobacco) or normal (15.8mg/g; double-blind). E-liquids contained either low (0.3%) or moderate (1.8%; open label) levels of nicotine, and were limited to only tobacco/menthol flavor options or expanded to also include mint, fruit and dessert options. Cigarettes smoked per day (CPD) during week 12 was the primary outcome. Study recruitment ended early due to concerns about pending regulations and the availability/relevance of the study vaping products. RESULTS: Of 50 randomized participants, 32 completed the full 12-week study (equal attrition across groups). Two-way interactions emerged between cigarette nicotine content and e-liquid nicotine content for CPD ($p = 0.06$) and expired carbon monoxide (CO, $p = 0.02$) at Week 12. The decreases in CPD and CO in participants randomized to very low nicotine content cigarettes, relative to participants randomized to normal nicotine content cigarettes, were larger among those who received moderate nicotine e-liquid [mean difference (95% CI); -22.6 CPD (-35.6, -9.6); -14.8ppm CO (-27.0, -2.6)] versus low nicotine e-liquid [-7.22 CPD (-17.3, 2.87); 4.95ppm CO (-5.2, -15.14)]. CONCLUSION: The extent of public health benefits from limiting nicotine in cigarettes may depend on the nicotine delivery available via alternative products. Future clinical trials should strive to rapidly reach accrual goals while also considering adaptive designs to address challenges arising from the ever-changing nicotine marketplace.

FUNDING: Federal

SYM2D

THE FUTURE DIRECTION OF E-CIGARETTE TRIALS IN NEW ZEALAND? KEEPING UP WITH PRODUCT INNOVATION

Natalie K. Walker, PhD, Christopher R. Bullen. University of Auckland.

Two world-leading, pragmatic community-based clinical trials (N=657, 1124), undertaken in New Zealand by the authors, have contributed to the limited trial evidence base on the effectiveness and safety of first and second generation e-cigarettes for smoking cessation. The trials found that: 1) nicotine e-cigarettes are at least as effective as nicotine patches at supporting people to quit smoking, and 2) nicotine e-cigarettes combined with nicotine patches are more effective at supporting people to quit smoking than nicotine-free e-cigarettes combined with nicotine patches. However the design of e-cigarettes is rapidly evolving, in that they are becoming easier to use, and can now deliver nicotine at levels similar to that obtained from smoked tobacco, meaning new generation products may have a greater impact on smoking abstinence. Such rapid evolution in product design means that e-cigarette research quickly becomes out-of-date. Strategies therefore need to be identified that allow for testing of new devices as soon as they come to market. This talk will discuss a novel trial strategy planned in New Zealand that utilises online vaping retailers, with the system enabling rapid participant recruitment, access to a large number of trial participants and rapid investigation of the effectiveness and safety of novel e-cigarettes for smoking cessation as they come to market.

FUNDING: Unfunded

SYM3A

DIFFERENTIAL EXPRESSION OF IMMUNE CELL INSTIGATORS OF COVID-19 IN TOBACCO CIGARETTE SMOKERS AND ELECTRONIC CIGARETTE VAPERS

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SARS-CoV-2 gains cell entry when its Spike (S) protein is cleaved by host proteases TMPRSS2 and furin, thereby markedly increasing viral affinity for its receptor, ACE2, leading to infection. Beyond this, little is known about the mechanisms of virulence of the SARS-CoV-2, and the factors increasing vulnerability to severe infection in tobacco cigarette (TC) smokers with COVID-19. Further, the protease ADAM17 is activated by TC smoke and promotes inflammation through dysregulation of IL-6, a correlate of mortality in COVID-19. We reasoned that studies in young people who only smoke TCs, or vape electronic cigarettes (EC) (not both) would provide the opportunity to clarify whether nicotine or non-nicotine constituents in TC smoke increase expression of key proteins in COVID-19 pathogenesis, thereby providing valuable and urgently needed information to inform public health strategies to decrease vulnerability to COVID-19 infection. We compared levels of proteins critical for COVID-19 pathogenesis in immune cells collected before the pandemic in otherwise healthy young people who were TC smokers (n=9), EC vapers (n=12) or non-smokers (NS) (n=12). Using flow cytometry, we compared expression of ACE2, TMPRSS2, furin and ADAM17 in CD45+ immune

cells among these groups. TC smokers compared to NS had a significantly increased % of cells that were positive for ACE2 (10-fold, $p<0.001$), TMPRSS2 (5-fold, $p<0.001$) and ADAM17 (2.5-fold $p<0.001$). Additionally, the mean fluorescence intensity (MFI) of ACE2 and proteases in immune cells consistently showed greater mean ACE2 (2.2-fold, $p<0.001$), TMPRSS2 (1.5-fold, $p<0.001$), furin (1.1-fold, $p<0.05$) and ADAM17 (2-fold, $p<0.001$) in CD45+ cells from TCIG-smokers compared to NS. In CD45+ cells of ECIG-vapers, MFI of furin increased (1.15-fold, $p<0.05$) while MFI of TMPRSS2 tended (1.1-fold, $p=0.08$) to increase compared to NS. There were no other differences in protein levels of ACE2, furin, TMPRSS2 and ADAM17 between EC-vapers and NS. Smoking TCs but less likely ECs, may increase susceptibility to SARS-CoV-2, a finding which warrants further study to determine if switching to ECs may have a role in a harm-reduction strategy.

FUNDING: Federal; State

SYM3B

DIRECT EXPOSURE TO SARS-COV-2 AND CIGARETTE SMOKE ALTERS THE STEM CELL DERIVED AIRWAY REPAIR RESPONSE AND INCREASES INFECTION SEVERITY

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Most demographic studies are now associating current smoking status with increased risk of severe COVID-19 and mortality from the disease but there remain many questions about how direct cigarette smoke exposure affects SARS-CoV-2 airway cell infection. We directly exposed mucociliary air-liquid interface (ALI) cultures derived from primary human nonsmoker airway basal stem cells (ABSCs) to short term cigarette smoke and infected them with live SARS-CoV-2. We found an increase in the number of infected airway cells after cigarette smoke exposure as well as an increased number of apoptotic cells. Cigarette smoke exposure alone caused airway injury that resulted in an increased number of ABSCs, which proliferate to repair the airway. But we found that acute SARS-CoV-2 infection or the combination of exposure to cigarette smoke and SARS-CoV-2 did not induce ABSC proliferation. We set out to examine the underlying mechanism governing the increased susceptibility of cigarette smoke exposed ALI to SARS-CoV-2 infection. Single cell profiling of the cultures showed that infected airway cells displayed a global reduction in gene expression across all airway cell types. Interestingly, interferon response genes were induced in SARS-CoV-2 infected airway epithelial cells in the ALI cultures but smoking exposure together with SARS-CoV-2 infection reduced the interferon response. Treatment of cigarette smoke-exposed ALI cultures with Interferon β 1 abrogated the viral infection, suggesting that the lack of interferon response in the cigarette smoke-exposed ALI cultures allows for more severe viral infection and cell death. In summary, our data show that acute smoke exposure allows for more severe proximal airway epithelial disease from SARS-CoV-2 by reducing the mucosal innate immune response and ABSC proliferation and has implications for disease spread and severity in people exposed to cigarette smoke.

FUNDING: Federal; State; Academic Institution

SYM3C

THE IMPACT OF SMOKING, COMORBIDITIES, AND RACE/ETHNICITY ON COVID-19 INFECTION

Jiang Li, PhD, Meghan Martinez, Dominick L. Frosch. Palo Alto Medical Foundation.

Background: Smoking suppresses immune function in the lungs and increases the risk of lung infection. Because SARS-CoV-2, the virus that causes COVID-19, attacks the lungs, it could be an especially serious threat to those who have compromised pulmonary function as a result of smoking. Our aim was to explore the differences between laboratory-confirmed COVID-19 positive and negative cases to identify risk factors for testing positive for SARS-CoV-2. Methods: We analyzed electronic health records data from 8,853 patients who visited their usual primary care provider, had contact with and (suspected) exposure to SARS-CoV-2, and had a test for SARS-CoV-2 in a large, integrated healthcare system in northern and central California between February 20 and July 26, 2020. We used multivariable logistic regression models to identify risk factors for positive SARS-CoV-2 tests. Results: There were 392 (4%) patients in our sample who tested positive for SARS-CoV-2. Older age, being male, being Hispanic or Latino, and having more severe comorbidities are significantly associated with a positive test for COVID-19. Passive smokers (odds ratio: 3.71, 95% CI: 1.69-8.11) were more likely than non-smokers to be lab-confirmed positive, but no statistically significant differences were found when comparing current smokers or former smokers with non-smokers.



Conclusions: Our findings suggest that passive smokers as well as older patients, males, patients identifying as Hispanic/Latino, and patients with more severe comorbidities are at increased risk for testing positive for SARS-CoV-2. Our future studies will investigate the effect of comorbidities on the risk of infection and disease severity, ethnic variation in disease severity, and the risk of severe outcomes to active and passive smokers.

FUNDING: State

SYM4A

DISENTANGLING THE YOUTH GATEWAY OF E-CIGARETTES: FINDINGS FROM THREE DIFFERENT DATA SOURCES

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Significance: Observational studies assessing the impact of e-cigs (EC) on youth smoking suffer from confounding. Here we use a three-pronged approach to address this issue. First, smoking rates among adolescents with initial EC use are compared with 1) a real-world control group (adolescents with initial non-combustible, non-cigarette tobacco (NNT) use), 2) a synthetic control group, selected using propensity score matching (PSM) and 3) associations of changes in youth EC use and smoking uptake at population level are assessed using timeseries analysis. Methods: For analyses 1 and 2, EC initiators, real-world and synthetic controls come from NYTS (2014-2015, N=37,417, age 9-18) and the first three PATH waves (2013-2016, N=5,544, age 12-17). In NYTS, youths were asked which tobacco product they had used first to identify EC and NNT initiators retrospectively. In PATH, initiators were those without product use at wave 1 who had started by Wave 2. The main outcome was ever and current cigarette smoking assessed cross-sectionally in NYTS and prospectively at Wave 3 in PATH. In both studies, socio-demographic/school and smoking susceptibility characteristics were used in PSM to select matched synthetic controls. For analysis 3, data come from the Smoking Toolkit Study (STS) (2008-2018, N=37,105, age 16-24) to predict prevalence of ever smoking (as indicator of uptake) from prevalence of e-cig use. Results: In NYTS, EC initiation was associated with lower ever (24.3%) and current (0.8%) smoking rates compared with NNT initiation (53.4%/9.3%) and synthetic controls (30.7%/2.7%). In PATH, EC initiators had similar ever (13.9 vs 21.2%) but lower current smoking rates (0.9 vs 8.0%) than NNT initiators. Synthetic controls had lower ever (3.7%) but not current (0%) smoking rates than EC initiators. In STS, there was no evidence for an association between EC use and ever smoking prevalence (B=-0.015, 95%CI -0.046 to 0.016; p=0.341). Conclusion: The impact of EC use on subsequent smoking is complex and may depend on underlying sample characteristics as evidenced by contradictory results in NYTS and PATH. At population level, the net effect appears to be negligible.

FUNDING: Nonprofit grant funding entity

SYM4B

SHEDDING LIGHT ON THE RELATIONSHIP BETWEEN ADOLESCENT E-CIGARETTE USE AND COMBUSTIBLE CIGARETTE SMOKING VIA CONJOINT DEVELOPMENTAL TRAJECTORIES

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Significance: About 20% of adolescents are current (past 30-day) e-cig users, while ~10% currently smoke combustible cigarettes. Whether e-cigs serve as a catalyst or a replacement for combustible cigarette smoking has been the subject of much debate. The present study sought to lend clarity to this debate by investigating the conjoint developmental heterogeneity of these two tobacco products among adolescents. Methods: Adolescents (N = 1835) from public high schools outside of Philadelphia, PA completed in-classroom surveys at wave 1 (fall 2016, beginning of 9th grade) and at 6-month intervals for the following 36 months (fall 2019, beginning of 12th grade). E-cig use and combustible cigarette smoking were measured (i.e., lifetime use, frequency of use, and time since last use) at all seven waves. An ordered categorical variable was created for both e-cig use and cigarette smoking (never use = 0, ever use = 1, past 6 months use = 2, past 30 day use = 3). A Sequential Process Growth Mixture Model (SPGMM) modelled the repeated measures of e-cig use and combustible cigarette smoking concurrently across the 7 waves. Baseline covariates were included in the model to define the conjoint developmental trajectories. Results: The SPGMM revealed four conjoint trajectories. A Dual Use group (n=95) was characterized by increasing e-cig use across time and the maintenance of combustible cigarette smoking that was already present at baseline. The Single Use group (n = 283) had a pattern of increasing e-cig use across time, but no combustible cigarette smoking. The Decreasing Use group (n=232) was characterized by decreasing e-cig use and decreasing combustible

cigarette use across time. The largest group adolescents used Neither (n=1230) e-cigs or combustibles cigarettes. Covariates created a profile of the adolescents who comprised the four groups. Conclusion: The findings highlight that the relationship between adolescent e-cig use and combustible cigarettes smoking varies. Identifying adolescent subgroups with distinct single and dual use patterns may optimize tobacco prevention efforts and focus tobacco regulation.

FUNDING: Federal

SYM4C

EXAMINING THE EFFECTS OF E-CIGARETTE TAXES USING MONITORING THE FUTURE DATA

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Significance: One potential solution to answering the question of whether e-cigarettes are a gateway to traditional cigarette use among youth is to use quasi-experimental variation in e-cigarette use to study the effect this has on current period e-cigarette use and subsequent period cigarette use. In the United States quasi-experimental variation can be obtained from e-cigarette policies enacted at the state level and lower. As of January 2020, e-cigarettes cannot be purchased by people under age 21 in any state, 22 states have enacted e-cigarette taxes, and 16 states have comprehensively banned the indoor use of e-cigarettes in bars, restaurants, and private worksites. Dr. Pesko and colleagues have published three papers exploring the effect of e-cigarette minimum legal purchase age laws on youth cigarette use across multiple data sources, and all find that they lead to more cigarette use, which is opposite of what one would expect if e-cigarettes are a gateway to traditional cigarette use. E-cigarette taxes are an additional source of policy variation affecting youth that has not yet been studied. Methods: We estimate the effects of e-cigarette taxes on youth e-cigarette and cigarette use using Monitoring the Future (MTF) data from 2014-2018 for approximately 200,000 youth. We evaluate the effect of e-cigarette taxes occurring in 10 states and 2 major counties by the end of 2018. We use difference-in-difference-like regression modelling that controls for state fixed effects, year-by-quarter fixed effects, other tobacco control policies, and demographics. Results: A \$1 increase in standardized e-cigarette taxes reduces any past 30-day youth e-cigarette use by 0.3 percentage points (p<0.10). A \$1 increase in e-cigarette taxes meanwhile increases adult ever e-cigarette use by 3.9 pp (p<0.01) and current cigarette use by 0.8 pp (p<0.05). Conclusion: Using plausibly exogenous variation in e-cigarette taxes, we find that these taxes behave as intended by reducing youth e-cigarette use. However, these same taxes increase cigarette use, which does not lend evidence to the gateway theory.

FUNDING: Federal

SYM4D

EPIDEMIOLOGICAL APPROACHES TO EVALUATING THE ASSOCIATION OF E-CIGARETTE USE WITH SUBSEQUENT CIGARETTE INITIATION

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Introduction. Studies have used various methods to examine the association of e-cig use with subsequent cigarette initiation among youth, findings which have critically important implications for tobacco control efforts surrounding e-cigs. Here, we summarize findings from three methodologically distinct epidemiological approaches to evaluating this association and discuss ongoing efforts to understand the observed associations. Methods. Data were from youth and young adults in multiple prospective cohort studies of youth in California and Connecticut. Approach 1: Assessment of the prevalence of any nicotine use (cigarettes or e-cigs) by year, from 2002-2019, in multiple repeated cross-sectional studies. Approach 2: Multinomial logistic regression analyses to evaluate the association of baseline e-cig use (never/ever), among never cigarette smokers, with frequency of cigarette smoking at follow-up. Analyses also investigated transitions between single or dual product use at baseline with past 30-day single or dual product use at follow-up. Approach 3: Five waves of data were used to simultaneously estimate transition rates for initiation and cessation of each product (e-cigs and cigarettes) in a joint polytomous logistic regression model. Results. The total level of e-cig or cigarette use in more recent years (2014-2019) exceeded the rate of cigarette use a decade prior, suggesting use by those who would not have smoked. E-cig use was a stronger risk factor for cigarette smoking (and was associated with greater frequency of cigarette



smoking) than the reverse, both in independent models, joint models of single vs. dual use, and in models simultaneously evaluating the risk of initiation or cessation of each product. Conclusions. Findings from multiple epidemiological studies suggest that e-cigs appear to draw in new youth to nicotine use and increase the risk for subsequent smoking initiation and greater frequency of smoking. Additional research to better understand mechanisms underlying these associations – to minimize the adverse effects of e-cigs among young people – are needed to inform tobacco control strategies.

FUNDING: Federal; State

SYM5A

ASSESSMENT AND TREATMENT OF BLUNT USE AMONG AFRICAN AMERICAN YOUNG ADULTS

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Background: The high prevalence of concurrent cannabis and tobacco use is partly due to the use of co-administered products such as blunts. Blunts are partially or entirely hollowed out little cigars and cigarillos (LCCs) that are filled with cannabis. Blunt use is popular among young adults, especially among African Americans who have been disproportionately targeted by the tobacco industry's aggressive marketing plan to promote LCC use in minority communities. This qualitative study was designed to gain a fuller understanding of how young African American adults characterize their blunt use in an effort to inform assessment, prevention and treatment strategies. **Methods:** Participants (N = 20) who self-identified as African American young adults (ages 18-29) and reported daily or almost daily blunt use were recruited to participate in semi-structured qualitative interviews. The interviews were conducted as the first phase of a larger project designed to develop and pilot test a social media intervention for blunt smokers. The high-level interview questions elicited information on blunt use history, reasons for blunt use, attitudes towards treatment and quit experiences. **Results:** Participants were mostly male (75%) and reported smoking blunts nearly every day (M = 26.3 days, SD = 5.5) in the month prior to the interview. Three themes emerged from the discussion regarding (1) how blunts are described, (2) how cannabis quality impacts how blunts are made and smoked and (3) norms about when and how blunts are smoked in groups. **Conclusions:** As consistent with previous studies, findings highlight the need for a comprehensive assessment of blunt use that addresses nuances in the descriptions of blunt use among users and differences in the quality and quantity of cannabis used to make blunts. Moreover, findings regarding the social aspects of blunt use has implications for how social networks might be leveraged in the public health response to cannabis and tobacco co-use. Additional studies are needed to inform the assessment, prevention and treatment of blunt use among African American young adults who are inordinately represented among heavy blunt smokers.

FUNDING: Federal

SYM5B

DIGITAL HEALTH TOOLS FOR ASSESSMENT AND INTERVENTION TARGETING TOBACCO AND CANNABIS CO-USE

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Background: Co-use of tobacco and cannabis is common and can be a barrier to successful smoking cessation. Novel digital health approaches can improve our understanding of co-use patterns and reduce barriers to accessible treatments for individuals who are co-using. We conducted a systematic review to summarize current research on digital health for assessment and intervention targeting tobacco and cannabis co-use, and to answer the following questions: Which digital tools have been used? Which populations have been targeted? And what are the implications for future research? **Methods:** Relevant literature was searched on PubMed up to February 2020 using a systematic strategy. The search identified 488 publications. Based on screening of titles and abstracts, 28 articles were considered for full-text review and a total of 9 studies met the inclusion criteria, including 4 assessment studies and 5 cessation intervention studies. These studies were published between 2014 and 2020. **Results:** Ecological momentary assessment (EMA) via text messages or interactive voice response calls has been used to capture co-use patterns within specific time windows or co-administration of tobacco and cannabis via blunts among young adults. Moreover, studies have demonstrated the feasibility of multicomponent interventions targeting dual cessation of both substances among adult co-users with cannabis use disorder, delivered via smartphone apps, online, and computer modules. **Conclusions:** Digital tools, particularly those combining EMAs and mobile sensors, should be expanded to assess co-use of

emerging tobacco and cannabis products. Digital cessation interventions should be tailored to different groups of co-users and address specific mechanisms underlying different co-use patterns. Fully powered randomized controlled trials are needed to examine the efficacy of digital health interventions, and interventions that sustain long-term effects need to be developed.

FUNDING: Federal

SYM5C

TOBACCO CO-USE AFFECTS TREATMENT OUTCOMES IN A PILOT TRIAL OF VARENICLINE FOR CANNABIS USE DISORDER

Erin Martin, B.S., Nathaniel L. Baker, Aimee McRae-Clark. Medical University of South Carolina.

Aims: To assess differential outcomes by tobacco use status in a placebo-controlled pilot trial of varenicline in the treatment for cannabis use disorder. **Methods:** Participants (n=72) were randomized to receive either varenicline (goal dose 1 mg BID; n=13 smokers, 22 nonsmokers) or a placebo (n=19 smokers, 18 nonsmokers) for 6 weeks. Primary study outcomes were collected at baseline and weekly thereafter, and included both objective (urinary THC-COOH, cotinine) and subjective (negative affect, cannabis craving) measures. Daily cannabis and cigarette use data were obtained using Timeline Follow-Back. Functional neuroimaging sessions were conducted at baseline and at end of treatment. **Results:** Although not powered to detect stratified differences, efficacy estimates are reported. The number of cigarettes smoked per day was positively correlated with cannabis use sessions per day at baseline ($\rho=0.36$, $p=.04$), but no differences were observed between smokers and nonsmokers in baseline measures of cannabis craving (48 (2.8) vs. 44.3 (2.5)) or negative affect (1.53 (0.31) vs. 1.30 (0.27)). During treatment, smokers receiving varenicline reported fewer cannabis use days on average than those receiving placebo (42% (11.3) vs. 76.4% (8.5)) and nonsmokers in either condition (Varenicline: 52.9% (10) vs. Placebo: 53.6% (11.7)), and cigarettes smoked per day was positively associated with cannabis use days ($p=.001$). Smokers receiving varenicline also reported a greater reduction from baseline in cannabis craving at end of treatment compared to the placebo (-28 (4.8) vs. -18.8 (4.8)) and compared to nonsmokers in either condition (Varenicline: -18.6 (4.4) vs. Placebo: -24.3 (5.2)). In contrast, nonsmokers receiving varenicline reported a greater reduction in negative affect from baseline compared to placebo (-1.04 (0.5) vs. -0.53 (0.61)) as well as smokers regardless of randomization (Varenicline: -0.66 (0.75) vs. Placebo: -0.50 (0.55)). Urine and imaging results have not yet been analyzed. **Conclusion:** Preliminary results suggest varenicline may have differential effects in the treatment of cannabis use disorder as a function of tobacco use status.

FUNDING: Federal; Pharmaceutical Industry

SYM5D

PHASE 2A ADAPTIVE BAYESIAN TRIAL OF CANNABIDIOL IN CO-USERS OF CANNABIS AND TOBACCO - EFFECTS ON CANNABIS AND TOBACCO USE

Tom P. Freeman, PhD. University of Bath and University College London.

Background: There are no pharmacotherapies for cannabis use disorders, and cannabis is frequently co-administered with tobacco. **Methods:** In the first stage of this adaptive Bayesian trial, participants meeting DSM-5 cannabis use disorder criteria who co-administered cannabis with tobacco were randomly assigned to 4-week treatment with oral cannabidiol (200mg, 400mg, or 800mg) or matched placebo. In the second stage of the trial, new participants were randomly assigned to placebo or doses deemed efficacious in the interim analysis. The primary endpoints were lower urinary THC-COOH:creatinine ratio, increased days per week with abstinence from cannabis during treatment, or both, evidenced by posterior probabilities that cannabidiol is better than placebo exceeding 0.9. Cigarette use and urinary cotinine:creatinine ratio were secondary outcomes. **Outcomes:** In the first stage of the trial, 48 participants were randomised to cannabidiol 200mg, 400mg, 800mg, or placebo (1:1:1:1). At interim analysis cannabidiol 200mg was eliminated as an ineffective dose. In the second stage of the trial an additional 34 participants were allocated to cannabidiol 400mg, 800mg, and placebo (1:1:1). At final analysis, cannabidiol 400mg and 800mg exceeded primary endpoint criteria for both primary outcomes. For urinary THC-COOH:creatinine ratio, the probability of being the most efficacious dose compared with placebo given the observed data was 0.9995 for cannabidiol 400mg and 0.9965 for cannabidiol 800mg. For days with abstinence from cannabis, the probability of being the most efficacious dose compared with placebo was 0.9966 for cannabidiol 400mg and 0.9247 for cannabidiol 800mg. Tobacco outcomes were mixed, but cannabidiol 400mg reduced cigarette consumption compared to placebo during treatment (-5.04, 95% Interval Estimate: -6.57 to -3.47) and up to



24-week follow up (-1.32, 95% Interval Estimate: -1.89 to -0.60). Interpretation: In the first randomised clinical trial of cannabidiol in co-users of cannabis and tobacco, daily oral doses of 400mg or 800mg were more effective than placebo at reducing cannabis use. Cannabidiol 400mg reduced cigarette use during treatment and follow up.

FUNDING: Nonprofit grant funding entity

SYM6A

HOW TO SAY NO SO YOU CAN SAY YES: SETTING PRIORITIES

Dorothy K. Hatsukami, PhD. University of Minnesota.

One of the biggest career challenges is establishing and maintaining priorities so that a woman scientist can focus on what is most important to her. For this presentation, eleven past women presidents and award recipients of the Society for Research on Nicotine and Tobacco were asked the following questions: 1) Broadly, what would you say to women in science about setting priorities? 2) How do you go about setting your priorities that have contributed to your success in your professional life? 3) What are the challenges or mistakes that you have made in your career in setting priorities that can provide lessons to the women in science? 4) How have your priorities shifted across your career or have they? The responses were generally consistent among these women scientists and included the following responses. 1) Establish priorities across different areas (family/friends, career, self) in your life ("know what you value and find meaningful"); 2) Establish priorities at work by defining your goals and scientific focus and creating a roadmap to achieve those goals, while at the same time being flexible to take advantages of opportunities that arise; 3) Recognize that priorities will shift over time depending on life circumstances, academic positions, or phase of career; 4) Be aware of potential traps (e.g., focusing on short-term rather than long-term goals, pleasing others at the risk of forgoing your own goals); 5) Know when and how to say no. Specific narratives in each of these areas will be provided.

FUNDING: Unfunded

SYM6B

MAINTAINING PRODUCTIVITY AND POSITIVITY THROUGH VARIOUS CAREER (AND LIFE) STAGES

Judith J. Prochaska, PhD MPH. Stanford University.

Academic research careers can provide the joys and challenges of juggling multiple roles, with continuous learning and idea generation, and working with diverse and varied teams, mentors and mentees. As one's career transitions through different stages, so does one's life with personal and social connections and responsibilities. How to maintain productivity and positivity through various career (and life) stages (not to mention a physically-distancing pandemic) is the focus of Dr. Prochaska's presentation. With self-reflection, open sharing, humor, and attendee involvement, this presentation will speak to strategies for supporting ongoing engagement and joy in one's professional, personal, and social spheres.

FUNDING: Unfunded

SYM6C

NIH INITIATIVES AND POLICIES TO SUPPORT WOMEN IN SCIENCE

Mary A. Kautz, PhD. National Institute on Drug Abuse, NIH.

So, you have worked long and hard to achieve success in your chosen research field and are excited about the career path ahead. And then it hits you... climbing that career ladder isn't quite as linear as you had hoped, as you find yourself increasingly trying to navigate a maddening web of unforeseen personal and/or professional obstacles that threaten to delay your forward progress. Some challenges may appear to be even more insurmountable by virtue of being issues predominately faced by women. Maintaining a work-life balance is important, yet it sometimes seems at odds with the demands associated with opportunities for career progression. The NIH is committed to providing programs that help prepare individuals for careers in biomedical, behavioral, social and clinical research, and by supporting the diverse and evolving needs of everyone, particularly women. In this session, Dr. Kautz will describe ways in which the NIH has strived to provide initiatives and policies to support women in science at all stages of

their research careers. Discussion points will include responses to questions commonly asked by grant applicants and she will provide references to numerous NIH resources, tools and information for later use by attendees.

FUNDING: Federal

SYM7A

THE ASSOCIATION OF NICOTINE VAPING PRODUCTS WITH QUIT SMOKING ATTEMPTS AND SMOKING CESSATION: LONGITUDINAL FINDINGS FROM THE 2016 AND 2018 INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY SMOKING AND VAPING SURVEY

Geoffrey T. Fong, PhD. University of Waterloo.

SIGNIFICANCE: This study examined the association between vaping frequency at follow-up and quit smoking attempts and cessation. **METHODS:** Sample-3903 adult (18+) daily smokers from Waves 1 (2016) and 2 (2018) of the ITC Four Country Smoking and Vaping Survey, a web-based cohort survey in Australia, Canada, England, and the US. At W1, smokers were classified as *exclusive smokers* (not vaping, n=3303) or *dual users* (also vaping \geq weekly, n=600). At W2, 18M later, outcomes were: having made a quit attempt (QA) and quit smoking. Weighted adjusted regression models examined association of W2 vaping frequency (daily, weekly, not at all/ $<$ weekly) with both outcomes. **RESULTS:** QA: Among all W1 smokers, those who were vaping daily at W2 were more likely to have made a QA in the last 18M (59.4%) than those vaping weekly (40.2%, p=.001) or not vaping (42.2%, p=.0001) at W2. Among W1 exclusive smokers, those who were vaping daily at W2 were more likely to have made a QA (60.9%) than those vaping weekly (40.2%, p=.0009) or not vaping (42.2%, p=.0001) at W2. Among W1 dual users, those who vaped daily at W2 were not more likely to have made a QA (39.5%), than those vaping weekly (40.7%) or not vaping (41.9%). W1 exclusive smokers who were vaping daily at W2 were more likely to have made a QA than W1 dual users vaping daily at W2 (60.9% vs. 39.5%, p=.0006). **Quit Smoking:** Among all W1 smokers, those who were vaping daily at W2 were more likely to have quit smoking (30.1%) than those vaping weekly (2.3%, p<.0001) or not vaping (10.6%, p<.0001) at W2. Among W1 exclusive smokers, those who took up daily vaping by W2 were more likely to have quit (31.6%) than those who were vaping weekly (2.3%, p<.0001) or not vaping (10.7%, p<.0001) at W2. W1 dual users who were vaping daily at W2 were no more likely to have quit (11.3%) than those not vaping at W2 (8.9%). W1 exclusive smokers vaping daily at W2 were more likely to have quit than W1 dual users vaping daily at W2 (31.6% vs. 11.3%, p<.0001). **CONCLUSION:** Daily vaping at follow-up rather than at baseline was associated with higher QAs and quitting. These findings have implications for evaluating the role of vaping in smoking cessation.

FUNDING: Federal; Academic Institution

SYM7B

CHARACTERISTICS AND CHANGES OVER TIME OF NICOTINE VAPING PRODUCTS USED BY PARTICIPANTS IN THE 2016, 2018, AND 2020 ITC FOUR COUNTRY SMOKING AND VAPING SURVEYS

Richard O'Connor, PhD. Roswell Park Cancer Institute.

SIGNIFICANCE: Regulation of nicotine vaping products (NVPs) varies between and within countries, impacting the availability and use of these products. Our objective was to examine changes in features of NVPs over an 18-month period among adult vapers in four countries with differing regulatory environments. **METHODS:** Primary data are from Waves 1 (2016) and 2 (2018), with additional unweighted data from Wave 3 (2020) of the ITC Four Country Smoking and Vaping Survey. Participants were 4734 adult, current NVP users at W2 in Australia, Canada, England, and United States. NVP characteristics included device type, nicotine concentration, adjustable voltage, and tank size. Cross-sectional analyses are primarily descriptive to compare NVP features across countries. A logistic regression examined factors associated with changing device type from 2016-2018. **RESULTS:** In 2018, box-tanks were the most popular NVP in each country (30.3 – 65.7%), followed by pen-tanks and cigalikes (26.2 and 18.7% overall, respectively). Box-tanks remained most popular in 2020 (27.4%), followed by pods (24.8%) and cigalikes (17.9%). In 2018, 75.6% of vapers used $<$ 20 mg/ml nicotine, though 21+ mg/ml was more common in the US (11.5%) than other countries (1.5 – 4.1%). High nicotine concentrations were more popular in 2020, with 41.9% of participants reporting 21+ mg/ml ($>$ 50% in CA, US). From 2016-2018, 78.7% of vapers continued using the same NVP. Participants who were 18-39 years old (p<.05), exclusive daily vapers (p<.01), and box-tank users (p<.001) were more likely to continue using their device type than participants who were older (55+), non-daily



vapers or dual cigarette-NVP users, and users of other device types. **CONCLUSION:** Similar to 2016, box-tank NVPs were the most common product used in 2018 and 2020 in all four countries, though pods have gained recent popularity in the 2020 survey data. Most continuing vapers used the same device type and features between 2016 and 2018. Some differences in NVP types and features (e.g., nicotine concentration) were observed between countries, suggesting that different regulatory environments may affect the NVP marketplace and consumer behavior.

FUNDING: Federal; Academic Institution

SYM7C

TRENDS IN SMOKING AND VAPING AMONG YOUTH AND YOUNG ADULTS IN CANADA, ENGLAND, AND THE UNITED STATES: FINDINGS FROM THE ITC YOUTH TOBACCO AND VAPING SURVEY

David Hammond, PhD. University of Waterloo.

SIGNIFICANCE: A range of new nicotine and tobacco policies continue to be implemented in Canada, England, and the US, most of which are targeted at reducing use among young people. This presentation will summarize population-level trends in vaping and smoking among young people between 2017 and 2020, and examine differences between countries with distinct regulatory approaches, as well as the impact of novel policies on e-cigarette marketing, flavours, retail access, and product standards. **METHODS:** Data we analyzed from 5 waves of the ITC Youth Tobacco and Vaping Survey, conducted in 2017, 2018, 2019, and 2020 (2 waves). Online surveys were conducted with more than 50,000 youth aged 16 to 19 years, as well as nearly 3,000 young adults aged 20 to 29 (in 2020 only), recruited from Nielsen consumer panels in Canada, England, and the US. Regression models were fitted to examine changes between countries over the five survey waves, using weighted data. **RESULTS:** From 2017 to 2020, greater increases in vaping were observed for daily/frequent vaping among youth in Canada and the US compared to England. The types of products used among past 30-day vapers has also shifted, including the use of high nicotine salt-based products, with greater increases in use of such products in Canada and the US. The results will include updated trends using August 2020 data, and will examine the impact of COVID-19 on smoking and vaping. The 2020 analyses will also focus on the impact of policies implemented in 2020, including flavour restrictions on 'pod-based' e-cigarette products in the US, as well as preliminary changes in response to increased marketing and retail restrictions for e-cigarettes in Canadian provinces. **CONCLUSIONS:** Patterns of youth vaping and smoking continue to evolve, with both similarities and differences across countries with different regulations. Implications for vaping policies that are currently being considered by regulators in the US and Canada will be discussed.

FUNDING: Federal

SYM7D

THE ILLEGAL EXPERIMENTAL TOBACCO MARKETPLACE I: EFFECTS OF VAPING PRODUCT BANS

Warren K. Bickel, PhD. Virginia Tech Carilion Research Institute.

SIGNIFICANCE: Banning sales of vaping products may have unintended outcomes, such as increased demand for illegal products. This study experimentally examined the effects of a vaping ban and a flavored vaping ban on the probability of purchasing illicit vaping products, and factors affecting purchasing from an illegal marketplace. **METHODS:** A crowdsourced sample of cigarette smokers, e-cigarette users, and dual users (n=150) were recruited. Participants completed hypothetical purchasing trials in an Experimental Tobacco Marketplace under three conditions (no ban, vaping ban, flavored vaping ban). Participants chose to purchase in a legal experimental tobacco marketplace (LETM) or an illegal experimental tobacco marketplace (IETM). Vaping products were available in the LETM and the IETM depending on the condition. Other tobacco products were always available in the LETM. Moreover, to assess the effect of fine scenarios, a hypothetical illicit purchase task with five fine amounts was used. **RESULTS:** Participants from all groups were more likely to purchase from the IETM when product availability in the LETM was more restricted, with e-cigarette users being most affected. The likelihood of purchasing illegal products was systematically affected by fine increases with e-cigarette users showing greater persistence in defending their illicit purchases. **CONCLUSION:** This study suggests that limiting or banning vaping products from the marketplace may shift preference towards purchasing vaping products in the illegal marketplace.

FUNDING: Federal

SYM7E

THE JUUL-ALTRIA MERGER AND IMPLICATIONS FOR THE VAPING INDUSTRY

David Levy, PhD. Georgetown University Medical Center, Silver Spring, MD, USA.

SIGNIFICANCE: Much of the concern about the vaping industry is related to the abuses stemming from the past behavior of firms in the cigarette industry. The cigarette industry is highly concentrated and has exerted monopoly power since at least 1965. However, that power has been challenged by competition from the vaping industry. In December 2018, Altria, the largest cigarette US company, announced an offer of \$12.8 billion for a 35% stake in Juul Labs, the largest vaping company. We will consider the cigarette and vaping product markets and the implications of the FTC investigation of the Altria-Juul merger. **METHODS:** We analyze the overall market for nicotine delivery products, including cigarettes, cigars, smokeless tobacco, e-cigarettes and heated tobacco products. We then consider market structure, including market concentration and entry barriers, focusing on the role of control in mass market retail and government regulations. We then consider implications for behavior. **RESULTS:** Whereas the FTC antitrust investigation has focused on closed vaping systems, we argue that the relevant market is the broader nicotine delivery product market, which includes all vaping and tobacco products. With Altria having a large market share in the key nicotine delivery product submarkets and posing an important entry barrier, the merger poses significant antitrust concerns. With their advantage in navigating current FDA regulations and their substantial control in other tobacco submarkets, cigarette firms, especially Altria, could also gain control of the vaping market. As a consequence, competition by current independent firms and potential entrants in the vaping submarket would be reduced, thereby increasing prices, reducing product innovation and reducing the promotion of accurate relative-risk information. **CONCLUSION:** The Altria-Juul merger has important public health as well as anti-competitive implications. It is important for public health advocates to recognize the importance of market structure on public health.

FUNDING: Federal

SYM8A

MICROAGGRESSIONS AND SMOKING BEHAVIOR AMONG BISEXUAL WOMEN: THE PROTECTIVE ROLE OF SOCIAL SUPPORT

Sarah Ehlike, Ph.D. Oklahoma Tobacco Research Center.

Significance: Bisexual women report higher rates of cigarette smoking than heterosexual and lesbian women. These differences may be due to experiencing more microaggressions (i.e., brief intentional or unintentional statements that communicate hostile or derogatory insults), which has been linked to increased risk of alcohol and cigarette use. Social support may be a protective factor that reduces the likelihood of smoking and mitigates risk associated with microaggressions. Due to limited research among bisexual women specifically, the current study examined if connection to the bisexual community (CBC) moderated the association between microaggressions (predictor) and the likelihood of current smoking (outcome) among 103 risky drinking emerging adult (18-25 years old) bisexual women who completed an online survey. **Methods:** Participants completed the Bisexual Microaggression and Microaffirmation Scales for Women (comprised of five subscales), the Connectedness to the Bisexual Community measure, and reported current cigarettes/day. Current smoking was defined as using at least 1 cigarette/day (n=42; 41%). **Results:** Logistic regression analyses revealed a significant cross-over interaction (p=.033) of dismissal microaggressions (e.g., "Someone dismissed my bisexuality as a fad.") and CBC. Specifically, among women with a lower CBC, experiencing more dismissal microaggressions was associated with higher odds of smoking (b=0.63, p=.072); whereas, among women with a greater CBC, experiencing more dismissal microaggressions was associated with lower odds of smoking (b=-0.48, p=.166). Additionally, among women with a lower CBC, experiencing more sexual microaggressions (e.g., "Someone asked me what genitals I like.") was associated with significantly higher odds of smoking (b=0.81, p=.034); however, this association was not significant for those with a higher CBC (b=-0.25, p=.422). **Conclusion:** Results suggest that tobacco prevention messaging that foster social network inclusion for bisexual women could provide a positive coping outlet that may help alleviate the consequences resulting from microaggressions, which could, in turn, reduce the likelihood of smoking.

FUNDING: Academic Institution; Nonprofit grant funding entity



SYM8B

ASSOCIATIONS BETWEEN MINORITY STRESS AND RESILIENCE AND SMOKING STATUS AMONG YOUNG ADULT CISGENDER SEXUAL MINORITY WOMEN

Andy Tan, PhD, MPH, MBA, MBBS. University of Pennsylvania.

Significance. Young adult cisgender sexual minority women (SMW) in the United States, including lesbian and bisexual women, have up to 4.8 times greater odds of cigarette smoking than heterosexual women. There are gaps in understanding risk and resilience factors associated with cigarette smoking among subgroups of LGBTQ populations at increased risks of tobacco use. This research is needed to develop culturally tailored interventions to reduce smoking-related health disparities in this population. **Methods.** We conducted an online survey in June-July 2020 among 269 young adult cis-gender SMW ages 18-30 (mean age 23 years; 72% bisexual, 8% lesbian/gay, and 20% other sexual identities; 56% White, 21% Black, 23% other races, and 21% Hispanic). We measured current cigarette smoking status (36% never smoker, 15% ever but not current smoker, 26% current non-daily smoker, and 23% daily smoker), theory-informed risks (sexual identity victimization and concealment) and resilience factors (brief resilience scale and LGBTQ community connectedness). Covariates included demographics, sexual orientation, and descriptive norms of smoking and quitting smoking in the LGBTQ community. We used multinomial logistic regression analyses to predict smoking status with the risks and resilience factors, adjusting for covariates. Results. Adjusted for covariates, lower level of concealment was associated with significantly increased relative risk of non-daily (RRR=2.40, 95% CI=1.45, 3.97) and daily smoking (RRR=3.34, 95% CI=1.87, 5.94) versus never smoking while higher resilience was associated with increased relative risk of daily smoking (RRR=1.86, 95% CI=1.03, 3.36) versus never smoking. Victimization and LGBTQ community connectedness were not significant predictors of smoking status. Significant covariates for non-daily and/or daily smoking included age, race, ethnicity, education, and descriptive norms of smoking and quitting. **Conclusions.** Lower level of concealment and increased resilience are associated with current smoking among young adult sexual minority women. Further research on interventions to address these factors is needed to reduce smoking in these populations

FUNDING: Federal

SYM8C

DIFFERENCES IN RECEPTIVITY TO PRO-TOBACCO MARKETING BY SEXUAL IDENTITY AND SEX: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Background: Lesbian, gay and bisexual [LGB] individuals use tobacco products at disproportionately high rates, compared to heterosexuals. Further, within the LGB population, LGB females report greater tobacco use than LGB males. Receptivity to pro-tobacco marketing is an established risk factor for tobacco use among the general population, yet little research has assessed whether receptivity contributes to tobacco use disparities on the basis of sexual identity and sex. This study examined differences in a) receptivity and b) the impact of receptivity on tobacco use across four groups: LGB males and females, heterosexual males and females. **Methods:** Data were from young adults (aged 18-24) in Wave 1 of the Population Assessment of Tobacco and Health Study (n=9,004). Chi square tests assessed differences in receptivity across each group. Multivariable logistic regressions examined the association between receptivity and past 30-day tobacco use, controlling for demographics and media use. Interaction terms (receptivity x sexual identity) assessed whether the effect of receptivity on tobacco use varied across groups. Separate models were run for cigarettes, cigars, e-cigarettes, smokeless tobacco and any tobacco use. Results: Receptivity was highest among LGB females for any tobacco product (77.93%), cigars (44.11%) and e-cigarettes (62.39%) and lowest among heterosexual females for cigarettes (52.06%) and smokeless tobacco (32.41%) compared to all other groups. In multivariable models, LGB females had greater odds of using all products compared to heterosexual females and greater odds of any tobacco and cigarette use, compared to heterosexual males. LGB females had lower odds of smokeless tobacco use compared to heterosexual and LGB males. For cigarettes, a significant interaction showed that the association between receptivity and cigarette use was stronger for LGB males than heterosexual males. **Conclusions:** There are differences in receptivity and its impact on tobacco use among young adults, by sexual identity and sex. These findings may aid in developing interventions that reduce tobacco use among sexual minorities.

FUNDING: Federal

SYM8D

COMPARING PERCEIVED EFFECTIVENESS FOR ANTI-SMOKING ARGUMENTS AMONGST YOUNG ADULT LESBIAN/GAY OR BISEXUAL CISGENDER WOMEN AND GENDER MINORITY INDIVIDUALS

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Significance. Anti-smoking campaigns tend to consider LGBTQ as a monolithic group. Subgroups within the larger LGBTQ community may benefit from specific messaging due to unique risks and resiliencies. We compared the perceived effectiveness of anti-smoking arguments between young adult lesbian/gay or bisexual (LGB) cisgender women and gender minority individuals. **Methods.** Data were collected in June and July 2020 from 285 young adult LGB cisgender women and gender minority participants (mean age 23 years; 54% current smokers and 45% non-smokers; 25% lesbian and 75% bisexual; 88% female and 13% were transgender or nonbinary; 58% White 58%, 21% Black, 21% other races). Participants viewed 6 arguments randomly selected from 34 anti-smoking arguments (health and anti-industry messages). The outcome was a 6-item argument strength rating scale (e.g. novelty of a message) used in previous research to evaluate anti-smoking messaging. We conducted repeated measures ANOVA to adjust for clustering within individuals to analyze differences in argument ratings for lesbian smokers, lesbian non-smokers, bisexual smokers and bisexual non-smokers, controlling for individual message and gender identity (cisgender women vs. transgender or non-binary). Results. There were significant differences in argument strength within (F(33, 1389) = 9.51, p < 0.01, $\eta^2_{\text{partial}} = 0.18$), but not between (F(33, 247) = 0.80, p = 0.77) individuals. We did not find significant main effects for gender identity, sexual identity or smoking status. However, there was a significant interaction effect (F(1, 247) = 5.41, p = 0.02, $\eta^2_{\text{partial}} = 0.02$), such that there were positive but non-significant differences in effectiveness of the messages between bisexual and gay/lesbian non-smokers ($\eta^2 = 0.25$, t(247) = 1.36, p = 0.17). However, messages were perceived less effective for bisexual than lesbian/gay smokers ($\eta^2 = -0.27$, t(247) = -2.11, p = 0.04). **Conclusion.** LGB cisgender women and gender minority participants rated the argument strength of anti-smoking messages similarly. Among smokers, bisexual participants rated the argument strength of anti-smoking messages as less effective than lesbian/gay participants.

FUNDING: Federal

SYM9A

MARKETING OF IQOS THROUGH DIFFERING REGULATORY PERIODS IN ISRAEL

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Significance. IQOS was introduced in the US in 2019 and received MRTP classification in 2020, making it critical to leverage data from other contexts to inform regulatory efforts. Israel is unique in that it represents 3 distinct regulatory contexts: 1) during IQOS's initial emergence in 2016, it was not categorized as a tobacco product; 2) in 2017, it was classified as a tobacco product in a relatively weak regulatory context; and 3) new progressive legislation (e.g., advertising bans, plain packaging, point-of-sale [POS] bans) were implemented in 2019-20. **Methods.** This study: 1) analyzed adspend, distribution, and marketing content (provided by a professional marketing surveillance firm); and 2) conducted POS observations in 80 retailers carrying HEETS in 4 large Israeli cities in 12/2019 (before POS display ban and plain packaging went into effect), adapting the Standardized Tobacco Assessment for Retail Settings. Results. Advertising content shifted thematically over the regulatory periods and across media channels; overall adspend and adspend by media channel also showed change over time. With regard to POS, all retailers sold cigarettes; 51% carried also electronic cigarettes (predominantly JUUL). Only one retailer carried the IQOS device in addition to carrying HEETS. HEETS packages were visible to customers in 46% of retailers. Over 60% carried at least three HEETS different flavours (out of five available). Posted ads were uncommon. In 20% of retailers, a special IQOS product display cast was prominent; 25% of retailers placed cigarettes and 14% placed HEETS near youth-oriented merchandise. In all but one retailer, HEETS were sold at higher prices than cigarettes, on average 21% more expensive. Only one retailer was located in a low socioeconomic cluster neighbourhood. **Conclusions.** This study provides insights into IQOS marketing strategies during regulatory changes in Israel. Findings suggest that 1) the industry adapts to regulatory changes with regard to its messaging and communication channels; and 2) POS was a critical channel for promoting IQOS historically (with some indications of targeting youth and/or higher socioeconomic status populations).

FUNDING: Federal



SYM9B

ANALYZING CONSUMERS' REACTIONS TO MODIFIED RISK STATEMENTS IN IQOS ADVERTISEMENTS

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Significance: Phillip Morris International (PMI) sought permission to market the IQOS heated tobacco product with the modified risk tobacco product (MRTP) claims that switching completely to IQOS would reduce risk of tobacco-related disease. Support for these claims is based on internal research from PMI, and independent studies are needed to evaluate consumers' reactions to such claims. This paper assessed smokers' and non-smokers' spontaneous reactions to MRTP statements on IQOS advertisements. Methods: Participants (N=2914) were current smokers (n=1523) or young adult non-smokers (n=1391). In 2019, participants were randomized to one of eight treatment conditions where they saw IQOS advertisements with different combinations of language features (e.g., hypothetical vs. definitive language, etc.). After exposure, participants were asked to list every thought that came to mind when looking at the ads. Those responses were coded for response sentiment (positive or negative), intentions to use IQOS, aesthetic evaluation of IQOS, health perceptions about IQOS, evaluation of MRTP claims, curiosity about IQOS, mix-up between IQOS and cigarettes or e-cigarettes, and mentions of addiction. This report focuses on participants (N=2914) from the treatment conditions. Results: We are currently analyzing data. Preliminary analyses show a similar proportion of positive (36%) and negative (38%) sentiment. Only 7% indicated intentions to use IQOS, while 6% expressed intentions not to use IQOS. Aesthetic evaluations were more positive (12%) than negative (6%). Participants described more negative health outcomes (20%) than benefits (10%). Few responses mentioned that IQOS reduced risk of disease (5%). Addiction was mentioned in 12% of responses, and participants rarely confused IQOS with e-cigarettes (4%) or cigarettes (2%). Additional analyses would determine if participant responses for each category differed by condition, tobacco use status, and demographics conditions (age, gender, race). Conclusions: Using spontaneous reactions to MRTP claims provides evidence on consumers' responses to the potential marketing materials for IQOS and whether these claims are misleading.

FUNDING: Federal

SYM9C

VISUAL EXPOSURE TO IQOS USE AS A SMOKING AND VAPING CUE

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Significance: The heated tobacco product (HTP) IQOS is available in over 50 countries and was authorized for sale by the United States (U.S.) FDA in 2019. Currently, relatively few people in the U.S. have been exposed to IQOS, which presents an opportunity for examining its potential salience as a smoking cue. Thus, we examined whether visual exposure to the use IQOS affected craving for cigarettes and e-cigarettes in U.S. adults. Methods: The study included N=520 participants (46% female; ages 19-61) and comprised of current (n = 183), former (n = 119), and never (n = 218) smokers residing in the U.S. and recruited via Amazon MTurk and Qualtrics online panels. Participants were randomly assigned to IQOS, cigarette, or bottled water cues that were delivered in the form of 5-minute videos depicting their use. Videos were identical on all other features (e.g., 27 hand-to-mouth movements, use of three actors, and ratio of indoor and outdoor settings). Main outcomes were pre-post video changes in smoking urge, cigarette and e-cigarette desire. Results: Relative to the water cue, both the IQOS and cigarette cues acutely increased smoking urge and desire in current smokers, (ps<0.01) with the IQOS cue uniquely increasing their e-cigarette desire as well (ps<0.01). The IQOS cue also produced an increase in e-cigarette desire in never smokers (p<0.05). Former smokers were largely unresponsive to the cigarette and IQOS cues. Conclusions: Current smokers are sensitive to IQOS exposure as a smoking cue and both current and never smokers are sensitive to IQOS exposure as a vaping cue. While HTPs are not identical to traditional cigarettes, their design and function may be similar enough to both combustible and e-cigarettes as to evoke desire for these products. As this new category of tobacco product gains popularity, their use and impact on passive observers should be considered in regards to overall regulatory policies.

FUNDING: Federal

SYM9D

MOUSE MODEL OF ACUTE EFFECTS OF INHALATION OF HEATED TOBACCO PRODUCT (IQOS) AEROSOLS ON LUNG TISSUE DAMAGE AND INFLAMMATORY CHANGES IN THE LUNGS

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Cigarette smoking is recognized to be a significant risk factor for the development of COPD, several cancers, cardiovascular and oral diseases. Cigarette smoke (CS) triggers inflammation and other physiological changes in the airway epithelium causing pulmonary damage and suppression of both innate and adaptive immunity resulting in repeated infections. Philip Morris International (PMI) developed a heated tobacco product (HTP), also called 'Heat-not-Burn' (HnB) product, that is currently marketed under the brand name IQOS. On July 7, 2020, the FDA approved the MRTP application for IQOS based on scientific studies that switching completely from conventional cigarettes to the IQOS system significantly reduces the body's exposure to harmful or potentially harmful chemicals. In our study, numerous markers of lung damage and inflammation including albumin and lung immune-cell infiltrates, proinflammatory cytokines and chemokines were quantified in lungs and bronchoalveolar (BAL) fluid from IQOS, CS or air-exposed (negative control) mice. Our study demonstrates that even short-term inhalation of aerosols from IQOS generates damage and proinflammatory changes in the lung that are substantially similar to that elicited by CS-exposure. **Funding:** Studies are supported by National Heart, Lung and Blood Institute of the NIH (R01HL142511) to YT and MLG, a Roswell Park Institute Alliance Foundation award and NCI Grant P30CA016056 involving the use of Roswell Park Core facilities.

FUNDING: Federal

SYM10A

TOBACCO VENDOR DENSITY IN RANCHI AND SILIGURI, INDIA

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BACKGROUND In most of India, tobacco vendors are not required to have a license to operate. Tobacco is commonly sold in a variety of vendor locations including permanent structures (bricks-and-mortar stores), semi-permanent structures like kiosks, and mobile vendors like street carts. Local officials in the Indian cities of Ranchi (population 1 million) and Siliguri (population 513,000) are considering policies to require vendor licenses to sell tobacco products. Restricting the eligibility of licenses to vendors who operate in permanent and semi-permanent structures is one strategy to reduce tobacco vendor density. Little is known about how many tobacco vendors there are in India although it is estimated that there are tens of millions. In New York City (NYC), there are approximately 16 tobacco vendors/km². METHODS In December 2019, trained data collectors conducted a census of tobacco vendors across three municipal wards in Ranchi and five wards in Siliguri. Data collectors recorded a GPS location for each observed tobacco vendor and categorized each vendor as brick-and-mortar, semi-permanent kiosk, or mobile street vendor. Spatial analyses were conducted using QGIS (v3.10). Vendor density is reported by city and by vendor type. RESULTS Data collectors identified N=926 tobacco vendors (n=559 in Ranchi; n=367 in Siliguri). Among different vendor types, 72% were brick-and-mortar (Ranchi n=325; Siliguri n=29), or semi-permanent kiosks (Ranchi n=121; Siliguri 192) and 28% were mobile vendors (Ranchi n=113; Siliguri n=146). Overall, tobacco retailer density was 99 vendors/km² in Siliguri (range across wards: 43–237 vendors/km²) and 69 vendors/km² in Ranchi (range across wards: 34–195 vendors/km²). DISCUSSION In both Ranchi and Siliguri, tobacco vendor density is extremely high, particularly in comparison to NYC. The composition of tobacco vendors differs between both cities, with Ranchi having a greater proportion of permanent bricks-and-mortar stores compared to Siliguri. A tobacco vendor licensing regime that restricts sales to only permanent and semi-permanent structures could reduce density by approximately 20% in Ranchi and 40% in Siliguri.

FUNDING: Nonprofit grant funding entity



SYM10B

SPATIAL PATTERNS OF TOBACCO RETAILER DENSITY REDUCTION IN NEW YORK CITY: PRELIMINARY EVALUATION OF A NASCENT POLICY APPROACH

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SIGNIFICANCE: Tobacco retailer density is disproportionately high in neighborhoods with a large proportion of Black, Hispanic, or low-income residents, and contributes to tobacco use disparities. In 2017, New York City (NYC) passed a measure to cap the number of tobacco licenses in each of its Community Districts at 50 percent of the number as of February 2018. Density reduction under this mechanism occurs gradually through retailer attrition. This study used geocoded licensing data to assess spatial patterns of policy impact. **METHODS:** Annual tobacco licensing lists between 2018-2020 were obtained for each Community District (n=59). Descriptive statistics highlighted total changes in tobacco retailer count and percent progress toward the target cap [i.e., (baseline number - current number)/(baseline number/2)]. Correlation analyses examined associations between progress and: land use characteristics (i.e., percent of land area with commercial and residential zoning designations) and Community District demographics (e.g., income, educational attainment, racial/ethnic distribution). **RESULTS:** Three years after policy enactment, the total number of tobacco retailers in NYC decreased from 7758 to 6885 – an 11% decline. On average, Community Districts reached 21.6% (sd: 8.6) progress toward their targets, with wide variation across districts (range: 5.3-44.4%). Progress toward target caps was negatively correlated with the percent of commercial land area ($r=-0.26$, $p=0.05$) and positively correlated with the percent of residential land area ($r=0.28$, $p=0.035$). The percent of non-Hispanic white residents was negatively associated with the rate of density reduction ($r=-0.25$, $p=0.055$). **CONCLUSION:** Tobacco retailer density declined considerably just 3 years after policy implementation. Unlike other policies to reduce retailer density that have inadvertently widened inequalities (e.g., tobacco-free pharmacy laws), preliminary evidence suggests that NYC's policy approach may have a more equal impact. Future research should examine policy impact at a neighborhood level, assess differences in attrition by store type, and characterize reasons for license forfeiture

FUNDING: Federal

SYM10C

LIMITING TOBACCO RETAILER DENSITY AND PROXIMITY TO SCHOOLS IN PHILADELPHIA: A TOBACCO CONTROL POLICY STRATEGY

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BACKGROUND Philadelphia has the highest smoking rate of any large US city, and smoking rates are twice as high among low-income residents compared to higher income residents. Smoking rates are also higher among African Americans than whites. Proximity to tobacco retail and its concomitant tobacco marketing has been linked to youth tobacco experimentation and to lower quit rates among adult chronic smokers. **POLICY APPROACH** In December 2016, Philadelphia's Board of Health passed a regulation limiting tobacco permit density to 1 per 1,000 daytime residents in each of the city's 18 planning districts, banning any new tobacco permits within 500 feet of a school, increasing the tobacco permit fee to \$300 to cover the administrative costs of the program, and implementing a loss of tobacco sales privileges and ability to renew a permit as a consequence of making 3 youth tobacco sales within a 2-year period. **EVALUATION** Analysis of tobacco retailer density in Philadelphia prior to the passage of these tobacco permit regulations showed significantly higher density of permits in low-income neighborhoods and significantly higher density of permits within 500 feet of a school in low-income neighborhoods, as compared to higher income areas of the city. The overall tobacco permit density in Philadelphia in 2016 (2.2 per 1,000 residents) was approximately twice that of other large US cities. A 2019 data analysis of the three years after the regulations were passed indicated tobacco retailer density declined by 20%, resulting in 659 fewer licensed tobacco retailers. Tobacco retailers near schools declined by 22% benefiting over 84,000 youth from over 200 schools. Benefits were slightly greater in low-income parts of the city. During this symposium we will review the process of passing a regulation strengthening policy around tobacco permitting in a city with high smoking rates and the impact on smoking sales. Lessons learned regarding the implementation of this policy and findings regarding its effects will also be discussed.

FUNDING: State

SYM10D

SYMPOSIA

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BACKGROUND: The West Pakistan Tobacco Vend Act of 1958 (TVA) required all retailers to have a license to sell tobacco products. However, the TVA was enforced only briefly, and vendors ceased holding licenses in the early 1960s. In 2015, the Tobacco Smoke Free Capital (TSFC) project began working with the Islamabad Capital Territory (ICT) to facilitate implementation of the TVA. The ICT envisioned the licensing program as a means to generate revenue for tobacco control efforts and to raise awareness of current tobacco control laws in retail settings (i.e. ban of the sale of loose cigarettes). The current study sought to evaluate the implementation of the TVA in ICT. **METHODS:** This was a multi-method study including interviews with informants involved in the implementation of the TVA, a face-to-face survey of tobacco retailers in ICT. Data collection was conducted in January 2019. **RESULTS:** Six participants were interviewed, 3 each from government and civil society. Participants reported that implementation of the TVA was impacted by lack of involvement from key stakeholders including federal government agencies. TSFC identified N=1,400 tobacco retailers in the ICT; a random sample of n=175 vendors were surveyed. More than one half (50%, n=88) of retailers had obtained a vendor license after the initial application period. Licensed vendors were more aware of tobacco control regulations and less likely to be found selling loose cigarettes (17% licensed; 26% unlicensed). Licensing revenue of 1.5 million Rupees was collected in the fiscal year 2017. **CONCLUSION:** Implementation of the TVA created a sustainable revenue stream to aid area tobacco control efforts. Involving a wider collection of stakeholders may improve overall efficiency of the licensing program in the ICT. As awareness of the program grows, the process of applying for retail licenses creates opportunities to further educate retailers on tobacco control regulations and builds a mechanism for enforcement and punishment, further strengthening tobacco control for the area.

FUNDING: Nonprofit grant funding entity

SYM11A

PHENX MEASURES FOR SMOKING CESSATION AND HARM REDUCTION

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The PhenX Toolkit (consensus measures for Phenotypes and eXposures), an NIH funded endeavor, provides recommended standard data collection protocols for conducting biomedical research. The Toolkit provides detailed protocols for data collection and tools to help investigators incorporate standardized protocols into their studies. Using protocols from the PhenX Toolkit facilitates cross-study analysis, increasing the scientific impact of individual studies. The PhenX protocols are selected by Working Groups of domain experts using a consensus process, which includes input from the scientific community. A Smoking Cessation and Harm Reduction Working Group has been convened to recommend biomarkers for smoking reduction and cessation. Potential biomarkers include measures of nicotine metabolism, genetic markers of risk, epigenetic signatures of smoking, and measures of carcinogens. This talk will describe the goals and process for recommending standardized measures for smoking cessation and harm reduction in light of the rapidly changing landscape of tobacco products.

FUNDING: Federal

SYM11B

USING BIOMARKERS IN SMOKING CESSATION TRIALS TO EXPLAIN DIFFERENTIAL TREATMENT RESPONSE

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INTRODUCTION: While there are several available treatments for nicotine dependence the effectiveness of these treatments are highly variable. Identifying biomarkers that can help predict treatment response has the potential to significantly improve smoking cessation outcomes. Our lab has used both genetics and neuroimaging techniques to investigate different biomarkers as predictors of treatment response. **METHODS:** Findings from several different smoking cessation trials will be presented. DNA was collected from participants in two smoking cessation trials: a randomized trial of varenicline versus bupropion (n=453); and a cohort of smokers provided NRT and behavioural counseling (n=450). DNA was genotyped using Infinium Global Screening Array (Illumina). Nicotine Metabolic Ratio (NMR) data was collected from two RCTs and baseline MRI data was



collected from 2 additional trials: one varenicline trial and one NRT trial. Age at onset of smoking and Fagerstrom Test for Nicotine Dependence were the measures of nicotine dependence; 7-day point prevalence abstinence at end of treatment was the measure of smoking cessation. **RESULTS:** For the genetics studies we will present findings from our GWAS and a PRS of treatment outcome using the GSCAN PRS. We also analysed 129 mitochondrial DNA (mtDNA) SNPs for their association to nicotine dependence and found associations with variants involved in oxidative phosphorylation within mtDNA. For the neuroimaging studies we found that increased BOLD activation during both a cue reactivity task and an incentive delay task predicted abstinence at end of treatment. **CONCLUSION:** The findings taken together provide additional evidence of the ability of certain biomarkers to predict nicotine dependence severity and end of treatment abstinence. In addition we have found that common mitochondrial variants involved in oxidative phosphorylation within mtDNA may contribute to the genetic vulnerability of smoking addiction. Analyses on nuclear-encoded mitochondrial genes and mitochondrial haplogroups are underway.

FUNDING: Nonprofit grant funding entity

SYM11C

PREDICTING SMOKING CESSATION TREATMENT OUTCOMES WITH GENETIC RISK SCORES AND BIOMARKERS

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Introduction: This study aims to evaluate how polygenic markers can enhance current treatment by incorporating an individual's genetic risk. **Methods:** We investigated two predictors: a) genome-wide polygenic scores for smoking phenotypes (ever smoking, age of smoking initiation, cigarettes per day, smoking cessation) based on large GWAS summary statistics and b) biomarker nicotine metabolite ratio. We evaluated bio-verified end of treatment abstinence among smokers receiving nicotine replacement, varenicline, bupropion, or placebo in two randomized control trials (N=1,898 including 807 in the Genetically Informed Smoking Cessation Trial (GISC) and 1,091 in the University of Wisconsin Trial). **Results:** We find that both polygenic risk scores for failed smoking cessation and polygenic risk scores for delayed age of smoking initiation predict end of treatment abstinence in both trials (meta-analysis OR=0.89, 95%CI=0.80-0.99, p=0.037; meta-analysis OR=1.2, 95%CI=1.1-1.4, p=0.00038 respectively, N=1,592 smokers of European Ancestry). In addition, we find that biomarker, nicotine metabolite ratio, predicts treatment response end of treatment abstinence in 807 GISC trial smokers of both European and non-European Ancestry. Specifically, slow nicotine metabolizers respond to nicotine replacement vs. placebo (OR=4.7, 95%CI=1.7, 14.9, p=0.0040), but not varenicline vs. placebo (OR=2.5, 95%CI=0.87-8.1, p=0.11). In contrast, normal nicotine metabolizers respond to both nicotine replacement and varenicline vs. placebo (OR=2.04, 95%CI=1.12-3.8, p=0.021; OR=4.15, 95% CI=2.38-7.49, p=9.8e-7 respectively), but they show a significantly higher efficacy on end of treatment abstinence with varenicline than nicotine replacement (OR=2.0, 95%CI=1.2-3.3, p=0.0050 for varenicline vs. nicotine replacement). **Conclusion:** Our evidence suggests that genetic risk scores and biomarkers may be useful in predicting the treatment outcome or responses for tobacco use disorder. These findings strengthen the case for the development and use of different genetic or biomarker predictors in clinical care.

FUNDING: Federal

SYM11D

BIOCHEMICAL MEASURES FOR SMOKING CESSATION TRIALS

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Biochemical verification of tobacco use and abstinence increases scientific rigor and is recommended in clinical trials of smoking cessation interventions, when feasible. Biochemical markers of exposure can be considered in three categories: 1) products of tobacco (or cannabis) combustion which include carbon monoxide and urine acrylonitrile metabolite; 2) markers of exposure to tobacco leaf products which include urine NNAL and minor tobacco alkaloids; and 3) markers of nicotine exposure per se which include saliva, blood or urine cotinine and urine total nicotine equivalents (TNE). Selection of biomarkers depends on which tobacco product use is being studied, what nicotine products if any are being used for treatment, what biospecimens are available and duration of time of abstinence that is being assessed. Abstinence from smoking in the short term can be assessed expired CO or cotinine, while longer term abstinence can be assessed with urine NNAL. Smokeless tobacco use can be assessed using cotinine, minor tobacco alkaloids and NNAL in the absence of exposure to combustion products. Nicotine replacement medication or electronic nicotine delivery system (ENDS) use can

be assessed by exposure to cotinine or urine TNE in the absence of combustion or tobacco leaf product biomarkers. Urine cotinine is a novel biomarker of tobacco smoke particulate exposure that can detect short term smoking but is not present with NRT or ENDS use. In addition to biomarkers for exposure, nicotine metabolites measured in saliva, blood or urine can estimate the rate of nicotine metabolism and may inform differential responses to smoking cessation treatment. Smoking cessation response to some medications, such as nicotine patches, is strongly influenced by the rate of nicotine metabolism, with greater cessation success among slower metabolizers. NMR has been proposed as an approach to individualized pharmacotherapy for smoking cessation.

FUNDING: Federal

SYM12A

MODELS FOR ESTABLISHING A TOBACCO TREATMENT PROGRAM IN A U.S. HOSPITAL OR OUTPATIENT CENTER

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Integrating tobacco treatment into clinical care is a critical component of tobacco control. Not only can diagnosis and treatment of medical conditions serve as "teachable moments" for encouraging tobacco cessation, but hospitals and medical center environments are well-suited to the implementation of tobacco treatment interventions. Using illustrative vignettes from several existing tobacco treatment programs in the US, as well as the National Cancer Institute Cancer Center Cessation Initiative (C3I) comprising tobacco treatment programs in 42 of the nation's cancer centers, we examined program components such as treatment models, billing procedures, and implementation considerations. We sought to identify commonalities and unique features rendering programs successful; barriers to developing, implementing, and maintaining such programs; and strategies to mitigate these barriers. We found that successful tobacco treatment programs shared several features including: (1) employing guideline-concordant pharmacotherapy and behavioral counseling; (2) integrating various components of tobacco treatment into electronic health record (EHR) systems; (3) obtaining endorsement and engagement from front-line clinical providers; and (4) securing stable funding sources within the medical systems. Barriers to developing and maintaining tobacco treatment programs were identified such as (1) modifying the EHR; (2) obtaining resources to train staff; and (3) integrating treatment within existing clinical workflows. Programs continue to evaluate and disseminate data related to reach and efficacy of programs, cost savings, and revenue generated, thus allowing sustainability of tobacco treatment programs. Institutions that wish to initiate tobacco treatment services, or increase the reach and efficacy of an existing service, may look to these examples for additional insight to implement these programs and to overcome barriers within their healthcare systems.

FUNDING: Federal; Academic Institution

SYM12B

CATEGORIZING SMOKERS TREATED IN A HOSPITAL-BASED INPATIENT TOBACCO TREATMENT INTERVENTION: A LATENT CLASS ANALYSIS

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At the Medical University of South Carolina (MUSC), the Tobacco Treatment Program (TTP) provides bedside counseling to inpatients who report tobacco use upon admission. Prior research suggests that characteristics of smoking behaviors, such as dependence, can impact the efficacy of interventions within a medical setting. The purpose of the present study is to explore the heterogeneity of smoking behaviors among a sample of 1,980 hospitalized patients visited by the MUSC TTP using Latent Class Analysis (LCA). Describing profiles of smokers, as well as ascertaining demographic predictors of profiles and evaluating differences in clinical outcomes between classes, will be informative for determining how to tailor future tobacco treatment interventions. Data related to level of smoking and attitudes towards quitting were collected during an inpatient treatment session, and variables were dichotomized either via affirmative response or median split. LCA models were run to fit 2, 3, or 4 classes; further iterations stopped after the 3 class model showed to have the best fit. Categorization of classes showed one class (19.3%) of light smoking, non-dependent patients who were motivated to quit. A second class (61.8%) of patients were categorized as heavy smoking, highly dependent smokers disinterested in quitting. A third class (18.9%) were also heavy smoking and highly dependent, but expressed high motivation to quit smoking. Multinomial logistic



regressions were conducted to ascertain demographic (age, race, gender) predictors of class membership. Males were more likely than females to be light smokers interested in quitting (class 1) relative to gender differences observed among heavy smokers (class 3). Multinomial logistic regressions also showed that 30 days following discharge, lighter smokers (class 1) had an increased likelihood of reported 7-day abstinence relative to differences in abstinence rates reported among the other classes. These data illustrate the heterogeneity of a sample of hospitalized smokers. Importantly, categorizations of patients are predictive of abstinence. Results have implications for tailoring inpatient smoking cessation interventions.

FUNDING: Federal

SYM12C

POINT-OF-CARE TOBACCO TREATMENT AND CANCER PATIENT SURVIVAL

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Smoking has negative effects on cancer outcomes but is often unaddressed in cancer care due to time and resource constraints. This study provides data on a low-burden point-of-care tobacco treatment program (ELEVATE) and its clinical relations with cancer patient survival for outpatients at a large cancer center. This study examines implementation of ELEVATE with two comparisons: a) pre-post comparison of ELEVATE, and b) ELEVATE versus usual care (UC). Pre/post and Quasi-experimental comparisons (ELEVATE vs. UC) assessed reach and successful abstinence related to ELEVATE in 3,968 patient smokers. Further, this study examines patient survival during the subsequent year post-implementation and its association with smoking status and tobacco treatment. The reach of tobacco treatment increased from pre-ELEVATE to post-ELEVATE (1.6% to 27.5%, RR=16.4 [9.5, 28.2], $p<0.001$). At post-implementation, the reach of tobacco treatment was significantly higher in ELEVATE versus UC clinics (27.5% vs. 11.8%, RR=2.3 [1.8, 2.9], $p<0.001$). The abstinence rate increased significantly from pre-ELEVATE to post-ELEVATE (12.0% vs. 17.1%, RR=1.4 [1.1, 1.7], $p=0.003$). At post-implementation, the abstinence rate was higher in ELEVATE versus UC clinics (17.1% vs 9.9%, RR=1.2 [1.1, 1.3], $p<0.001$). Current and former smokers have increased mortality compared to never smokers (HR= 1.56, 95%CI=1.34-1.82, $p<0.0001$; HR=1.32, 95%CI=1.18-1.48, $p<0.0001$, respectively), after adjusting for demographics and cancer types. Specifically, among current smokers, those not receiving tobacco treatment have higher mortality than those receiving tobacco treatment, compared with never smokers (HR=1.64, 95%CI=1.28-2.09, $p<0.0001$; HR=1.15, 95%CI=1.56-2.35, $p=0.71$). Implementation of a low-burden point-of-care treatment model was associated with pre-post increases in treatment engagement and clinical outcomes. Current and former smoking was associated with increased mortality while tobacco treatment was associated with decreased mortality. The point-of-care treatment model shows promise in reducing smoking in cancer centers. Future research should use experimental designs that increase strength of inference.

FUNDING: Federal; Academic Institution

SYM12D

UB PREGNANCY AND SMOKING CESSATION PROGRAM: PROCESS AND OUTCOME EVALUATIONS

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Pregnancy is a unique opportunity for women to quit smoking. Existing cessation programs face challenges including unsatisfying cessation rates, low adherence, high postpartum relapse, and limited evaluation of postpartum health consequences associated with cessation. The University at Buffalo ("UB") Pregnancy and Smoking Cessation Program (N=134) is a multicomponent behavioral program for smoking cessation during pregnancy and 2 years postpartum. Our outpatient program consists of 4 evidence-based components: education and counseling, smoking monitoring and feedback, contingent financial incentives, and social support. Pregnancy intervention included ten 30-minute sessions: twice per week in weeks 1-2 and once per week in weeks 3-8. Postpartum intervention is monthly from birth to 12 month (m) and then quarterly until 24 m. Smoking cessation rate was 63.3% during pregnancy. Most patients (85.7%) reported the program meeting their expectations and 100% would recommend the program to others. Program adherence decreased with time; pain and poor sleep predicted low adherence. Smoking cessation was associated with improved birth outcomes (e.g., small-for-gestational age, 11.8% among quitters vs. 62.5% among non-quitters) and normalized infant growth. Quitters had higher exclusive breastfeeding

intention (47.4% vs 16.7%), higher breastfeeding initiation (73.7% vs 30.8% among non-quitters), and longer breastfeeding duration. Quitters had reduced risk of insufficient gestational weight gain (GWG) than non-quitters (13.0% vs 60.0%), but had a high risk of excessive GWG (65.2%) than non-quitters (20.0%) or national average (47.5%). Postpartum depression did not differ by quitting status. By 12 m postpartum, 42.1% of quitters relapsed. Breastfeeding for 3 m or longer was associated with a lower risk of smoking relapse. We conclude a high smoking cessation rate during pregnancy is achievable through multicomponent intervention, and can improve postpartum maternal and infant health. Further efforts need to address adherence barriers (e.g., pain and poor sleep), cessation-induced weight gain, and postpartum relapse through novel intervention (e.g., breastfeeding).

FUNDING: Federal; Academic Institution

SYM13A

CIGARETTE AND ENDS USE AMONG ADULTS AND ASSOCIATIONS BETWEEN COVID-19 AND TOBACCO USE: THE LATEST DATA FROM THE PATH STUDY (2013-2020)

Andrew Hyland, PhD. Roswell Park Comprehensive Cancer Center.

The Population Assessment of Tobacco and Health (PATH) Study collects information on tobacco-use patterns, health, and other factors. This nationally representative, longitudinal cohort study of approximately 46,000 youth and adults in the United States began in 2013 with data collection occurring annually. In late 2020, the PATH Study added a special collection among a nationally representative sample of adults 20 years and older to examine tobacco use and explore COVID-19 issues, such as social distancing, diagnosis, and testing. This symposium will extend the PATH Study data presented at SRNT 2020 which examined cigarette and ENDS use in youth and young adults by presenting complementary data on adults. We will also report on the relationship between tobacco use and the COVID-19 pandemic using the late 2020 special data collection. This symposium will 1) provide prevalence estimates of tobacco products for adults over multiple waves of data (2013 to 2020); 2) describe initiation, cessation and transition across selected tobacco products; 3) describe product characteristics such as brand, device types, and flavor use; and 4) report on measures of COVID-19 diagnosis and severity by tobacco use status.

FUNDING: Federal

SYM14A

THE DIVERGENT REGULATORY STANCES TOWARDS E-CIGARETTES IN HIGH-INCOME CASE COUNTRIES: EVIDENCE FROM THE GLOBAL E-CIGARETTE POLICY SCAN

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Since 2014, the Institute for Global Tobacco Control at Johns Hopkins University has conducted the Global E-Cigarette Policy Scan, identifying country-level laws and other policies regulating e-cigarettes. The scan actively conducts surveillance and has identified policies in 100 countries. The scan is updated regularly and reports how policies regulate specific domain including product regulation, clean air, and age of purchase. The scan reports new policies and changes in policy by country. To frame a discussion in this symposium, about what drives e-cigarette regulatory policy convergence and divergence, this presentation introduces the country-level laws for Australia, Canada, and New Zealand, United Kingdom, and the United States, and considers how policy approaches can be classified in terms of a 'regulatory stance', and how those classifications, or stances have changed since 2014. These regulatory stances help to describe how policies can or may alter the size of a market in the future relative to the present. The presentation will describe the regulations for e-cigarettes in five case countries and the major changes these policy approaches have undergone in the last six years. Three of these countries (Australia, Canada and New Zealand) began with a prohibitionist regulatory stance towards e-cigarettes, which intended the market for e-cigarettes should make up none of their economies. Of those, Canada and New Zealand later adopted expansionist regulatory stances, meaning that these countries enacted policies that permitted growth in their e-cigarette markets, while Australia did not alter its original regulatory stance. Two case countries (United Kingdom and United States) began with an expansionist regulatory stance towards e-cigarettes, which imbued certain competitive advantages towards that market over substitute products. The United States has, to a



varied extent, revised its state and regulatory approach to adopt a permissive stance towards the market, while the United Kingdom kept its original regulatory stance. This descriptive work will enable comparisons across cases in the following presentations.

FUNDING: Nonprofit grant funding entity

SYM14B

THE AUSTRALIAN REGULATORY APPROACH TO E-CIGARETTES

Coral E. Gartner, PhD. University of Queensland.

Compared to peer high-income countries (New Zealand, United States, Canada, and the United Kingdom), Australia maintains the only prohibitionist regulatory stance for nicotine-containing e-cigarettes. All nicotine-containing products are automatically classed as a dangerous poison, if not intended for therapeutic use (e.g., approved nicotine replacement therapies) or in the form of tobacco intended for smoking. The inability of this framework to effectively regulate all types of tobacco and nicotine products was acknowledged by the Australian Government with recommendations outlined in the 2004-2009 National Tobacco Strategy to develop a comprehensive regulatory framework, which included harm reduction goals such as "incentives and controls to enable consumers unable to quit to shift to alternative nicotine delivery systems". However, these reforms were not implemented. Rather, Australian Government policy has become increasingly hostile toward the use of e-cigarettes for harm reduction purposes. This position, which is supported by the majority of health and medical organisations in Australia, has been justified as a "precautionary approach" due to a lack of definitive evidence on the safety and efficacy of e-cigarettes, and the potential risk that e-cigarette availability could undermine tobacco control efforts and addict adolescents. This presentation will give an overview of the Australian regulatory framework for nicotine and tobacco products, historical context and debates, and recent Government attempts to adapt the Australian Medicinal Cannabis Access Pathway to nicotine vaping products.

FUNDING: Unfunded

SYM14C

E-CIGARETTE REGULATORY POLICY CHANGE AND STASIS IN AUSTRALIA, CANADA, AND NEW ZEALAND: LESSONS FROM A MULTIPLE STREAMS APPROACH

Alex C. Liber, PhD. American Cancer Society.

Through a comparative study of the cases of Australia, Canada, and New Zealand, this study addresses how the concerns of public health advocates, business, bureaucrats, and politicians around e-cigarettes are translated into regulatory policy. Political science has only begun to apply its theories to the study of public health policies, and most of what drives public health policy outcomes remains poorly understood. Here, a qualitative comparative approach of three most-similar country cases is used to determine what factors enabled e-cigarette regulatory policy change or stasis. Structured by John W. Kingdon's Multiple Streams Approach to agenda-setting, the case studies examine how and why a country's regulatory stance towards e-cigarettes changed or did not. Qualitative techniques of document collection and key informant interviews (N=101) were collected to inform a comparative case study of e-cigarette regulatory policy and politics. In the Multiple Streams Approach, the problem and policy streams must become primed before they can merge with the politics stream and open a policy window. In the case countries, the problem stream became primed once a case country's current regulatory policy was deemed a failure when it was rejected by the courts as illegal, rejected by bureaucracies as not worth enforcing, or it failed to make adequate progress in reducing tobacco smoking. Next, the policy stream became primed once a country's public health policy community agreed on a consensus alternative regulatory stance expanding the market for e-cigarettes. Finally, the politics stream was primed when conditions in the problem and policy stream granted the case country's left-wing politicians' permission to support a regulatory stance change favored by business groups. This freed right-wing politicians to support regulatory stance change without facing a political penalty. Once all stakeholders agreed they would benefit more by adopting the alternative regulatory stance than by continuing with the failed policy, a policy window to change the failed e-cigarette regulatory stance opened.

FUNDING: Academic Institution

SYM14D

UNDERSTANDING THE ROLE OF EVIDENCE AND MANAGEMENT CONFLICTS OF INTEREST IN E-CIGARETTE REGULATION AND POLICY: A QUALITATIVE INTERVIEW STUDY

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Background: Public health guidelines aspire to be evidence-based and follow a transparent process to produce recommendations. Electronic cigarettes (e-cigarettes) are a useful case study to examine this process given the rapidly developing evidence base and range of vested interests in policy recommendations. In this study we conducted interviews with experts involved in developing e-cigarette guidelines to better understand the role of evidence and the management of conflicts of interest in producing recommendations about e-cigarette policy. Methods: We conducted 15 in-depth interviews with guideline methodologists, policymakers and academics from the three selected jurisdictions (UK, Australia and USA). Participants were asked about evidence selection and assessment, the role of evidence and the process for managing conflicts of interest. Thematic codes were developed and refined iteratively to reflect emergent themes. Results: All participants agreed that guidelines should be evidence-based, and the role of evidence is paramount to developing public health guidelines. Participants described barriers to developing e-cigarette guidelines, including the lack of long-term evidence-meaning only limited policy-relevant evidence is available to guide policy. Participants were also in agreement about the importance of declaring conflicts of interest and how these influence the sources of evidence that are drawn upon. Most participants stated evidence with links to the tobacco industry should be discounted, however, one participant acknowledged the quality of the evidence outweighs declarations of interest. Several participants acknowledged the presence of conflicting evidence can influence recommendations detailed in guidelines. Conclusions: We illustrated that public health guidelines need to take clear account of the evidence, but that experts involved in developing e-cigarette public health guidelines perceive there to be substantial challenges in how to handle conflicts of interest. Guideline developers should have a well-defined and robust process to assess the evidence when conflicts exist.

FUNDING: Federal

SYM15A

IMPACT OF STANDARDISED PACKAGING AND LARGER HEALTH WARNINGS ON CHOICE AND VISUAL ATTENTION AMONG COLOMBIAN SMOKERS AND NON-SMOKERS

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Background: Smoking-related morbidity and mortality is set to increase in Colombia over the next decade. Larger health warnings and standardised (or plain) packaging have been shown to be effective policies elsewhere, but local evidence is required to examine their likely impact in Colombia. Methods: Participants were 62 Colombian daily smokers, 58 weekly smokers and 55 non-smokers. Participants viewed cigarette packs with different levels of branding (fully-branded, standardised) and warnings of different sizes (30%, 50%, 70%). Using eye-tracking, we measured visual attention to the warnings versus the branding. Participants then completed a discrete choice experiment (DCE) where they were shown pairs of cigarette packs. Each pack was either fully-branded or standardised and had a 30% or 70% warning. Participants reported which cigarette pack they would rather try (Try); would taste better (Taste) and would be less harmful (Less-harmful). Results: In the eye-tracking experiment, warnings received more fixations when presented on standardised packaging and when they covered 70% of the pack. Daily smokers and weekly smokers paid less attention to warnings than non-smokers, however increasing warning size was particularly effective at increasing smokers' attention to warnings. In the DCE, participants were less likely to choose the standardised packs as those they would like to try and think would taste better. There was no evidence for branding's impact on which pack would be less harmful. Participants were less likely to choose a pack with the 70% warning for all outcomes. Conclusions: Our findings show that standardised packaging increases attention to warnings and that smokers' attention to warnings can be increased by increasing warning size. We also found that standardised packaging and larger warnings alter taste and harm perceptions of tobacco products and reduce intentions to try them. This is the first study examining the impact of standardised packaging and larger warnings using these methodologies in Colombia and the findings have implications for the implementation of new tobacco control policies in the country.

FUNDING: Nonprofit grant funding entity



SYM15B

YOUNG ADULT ROLLING TOBACCO SMOKERS' PERCEPTIONS OF PROMOTIONAL AND PLAIN ROLLING PAPERS

Crawford Moodie, PhD, Rachel O'Donnell. University of Stirling.

Background: Despite the global growth of rolling tobacco, we are unaware of any research that has explored smokers' perceptions of the types of rolling papers available, or plain rolling papers, which are now required in Canada and Israel. **Methods:** Eight focus groups were conducted with rolling tobacco smokers (N=50) in Greater Glasgow (Scotland) between February and March 2020. Participants were shown a number of packs of promotional rolling papers (natural, transparent, pre-rolled cones, flavoured) and plain rolling papers. **Results:** Rolling papers were often viewed as functional, a necessity for making roll-ups. The appeal of papers was based on the packaging, with a booklet style pack of natural papers viewed very positively, as well as novelty, usability and taste/smell. Participants often associated papers with particular users, with pre-rolled cones and some flavoured papers thought to be used by cannabis smokers or younger people and those just starting to smoke. In terms of harm perceptions, natural papers were viewed as a healthier choice than standard papers and more environmentally friendly, whereas transparent papers raised concerns about safety to both the user and the environment. Participants were generally ambivalent towards plain papers, which they did not feel would alter their purchasing or smoking behaviour, although some felt they may be less appealing to youth as the branding would be diminished. **Conclusions:** The panopoly of rolling papers available offers consumers considerable choice. As some promotional papers can increase appeal or create misperceptions of harm then standardising papers would help to counter this.

FUNDING: Nonprofit grant funding entity

SYM15C

PLAIN PACKAGING OF E-CIGARETTE PRODUCTS: AN EXPERIMENTAL STUDY OF APPEAL AMONG YOUTH

David Hammond, PhD, Jessica Reid. University of Waterloo.

Background: Standardized or "plain" packaging is effective in reducing appeal of cigarettes among young people. To date, several jurisdictions have mandated plain packaging of e-cigarettes, including Israel and British Columbia, Canada. This study examined the impact of plain packaging and brand imagery on interest in trying e-cigarettes among youth. **Methods:** Two online experiments were conducted in Feb 2020 as part of the ITC Youth Tobacco & Vaping Survey, conducted with 13,624 16-19-year olds in Canada, England, and the US. In Experiment 1, participants were randomized to view a set of 3 leading brands of e-cigarettes, in either their original external packaging ("branded" condition) or standardized "plain" packaging ("plain" condition). Participants were asked to select the product they would be most interested in trying, with an option to indicate no interest in any of the products. Experiment 2 used a within-subject design to examine brand imagery directly on e-cigarette devices, and potential sex differences in product appeal. Each participant viewed 4 pod-style e-cigarettes, including a "plain" device (solid black) and 3 devices in "skins" with colourful imagery (including 2 identified a priori as "female-oriented"), and was asked to select the product they would be most interested in trying. Logistic regression models were conducted to test the effect of condition, adjusting for demographics, smoking and vaping status. **Results:** In Exp. 1, participants in the "plain" packaging condition were significantly more likely to indicate "I have no interest in trying any of these products" (70.1%) than those in the "branded" condition (65.0%, $p < .05$). In Exp. 2, one of the two "female-oriented" devices was more likely to be selected by females. Results will be presented on specific brands and differences by vaping status. **Conclusions:** The findings suggest that plain packaging of e-cigarettes has the potential to reduce interest in trying among young people. Findings were mixed regarding using "skins" to target sub-groups. Future research should consider the effect of brand imagery and plain packaging on interest in using e-cigarettes for smoking cessation.

FUNDING: Nonprofit grant funding entity

SYM15D

EVALUATING CIGARETTE PACK INSERTS WITH MESSAGES ABOUT CESSATION BENEFITS AND TIPS TO QUIT: A RANDOMIZED FIELD TRIAL

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Background: Theory and observational studies suggest that cigarette pack inserts with messages on cessation benefits (response efficacy) and tips to quit (self-efficacy) can promote cessation, particularly when supplemented with pictorial health warnings (HWs). This experimental study assessed smokers' responses to inserts with efficacy messages using ecological momentary assessment (EMA). **Methods:** We conducted a 2X2 between-subject randomized field trial (inserts with efficacy messages vs no inserts; pictorial vs text-only HWs), randomizing 199 adults who smoked at least 10 cigarettes a day to conditions. We provided them with a 14-day supply of their preferred cigarette brand with packs modified to reflect their experimental condition. Over a two-week period, we used EMA to survey them approximately 5 times a day during their smoking sessions (when labeling exposures are most likely), querying levels of worry about harms from smoking, self-efficacy to cut down on cigarettes, self-efficacy to quit, hopefulness about quitting, and motivation to quit. Each evening, participants reported perceived benefits of cessation, perceived susceptibility to smoking harms, and forgoing any cigarettes in the prior 24 hours. Mixed-effects linear and logistic models were estimated to evaluate associations between these outcomes and treatment group relative to control (i.e., no inserts, text-only HWs). **Results:** No significant differences were found in sociodemographics or smoking-related characteristics across treatment groups. Relative to the control, smokers in the insert only group were more likely to report higher levels of worry about smoking harms ($B=0.75$, $p=0.0459$), self-efficacy to cut down on cigarettes ($B=0.62$, $p=0.0495$), hopefulness about quitting ($B=0.78$, $p=0.0403$), and response efficacy ($B=0.82$, $p=0.0172$), as well as greater likelihood of forgoing cigarettes ($OR=3.39$, $p=0.0273$). Smokers in the pictorial HW conditions (with and without inserts) were more likely to report forgoing cigarettes ($OR=2.29$, $p=0.1630$; $OR=2.44$, $p=0.1294$, respectively) than the control. **Conclusions:** Pack inserts with efficacy messages appear helpful for promoting smoking cessation.

FUNDING: Nonprofit grant funding entity

SYM16A

MENTHOL EFFECTS ON NICOTINE REWARD, AVERSION, AND USE BEHAVIOR IN A PRECLINICAL RODENT MODEL

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Significance: Menthol cigarette users have lower quit rates and a shorter latency to smoking the first cigarette of the day, compared to non-menthol users. African Americans also have a high prevalence of menthol cigarette use, possibly due to targeted advertising, biological factors, or both. Here, we used assays in preclinical rodent models to investigate specific processes by which menthol alters nicotine use behavior and addiction liability. **Methods:** Oral nicotine reward and aversion were examined by taste reactivity, and choice behavior was examined in the two-bottle choice assay. Brain dopamine reward-related responses to oral menthol were examined using voltammetry. Menthol effects on CNS-mediated nicotine reward were measured using intraoral menthol self-administration in combination with intravenous nicotine self-administration. All experiments were performed in Sprague-Dawley rats. **Results:** For taste reactivity, oral nicotine led to rewarding (1 mg/L in females, 3 mg/L in males) and aversive (10 mg/L and above in females, 30 mg/L in males) responses. The addition of menthol (0.005%) increased rewarding responses to low nicotine and decreased aversive responses to high nicotine. In male and female adolescent rats, oral nicotine only led to aversion to high nicotine concentrations but did not induce reward responses (compared to water). In two-bottle choice experiments in adult males, oral menthol also reversed the effects of oral nicotine. Examination of dopamine signaling in the nucleus accumbens revealed no change in dopamine response. Further, oral menthol did not alter intravenous nicotine self-administration behavior. **Conclusion:** Menthol increased the palatability of nicotine in the oral cavity by decreasing nicotine aversion and increasing nicotine reward. Menthol also increased nicotine choice and oral nicotine intake but did not alter brain dopamine reward nor nicotine self-administration.

FUNDING: Federal



SYM16B

INFLUENCE OF MENTHOL FLAVOR ON TOBACCO AND MARIJUANA USE BEHAVIORS

Suchitra Krishnan-Sarin, PhD, Krysten Bold. Yale University School of Medicine.

Understanding how characterizing menthol flavor influences the appeal and addictive potential of tobacco products may inform tobacco control efforts. We will present translational evidence from the Yale TCORS on the influence of menthol on the appeal, use, and abuse potential of tobacco products. Our experimental clinical studies of youth e-cigarette users suggest that menthol is appealing even at concentrations that are barely perceptible to users, raising concerns about what should be considered a characterizing flavor. We also observed that menthol not only reduces irritation from nicotine but that higher doses of menthol enhance liking for higher nicotine concentrations in e-cigarettes. Further, youth survey evidence suggests that self-reported use of menthol e-liquids, but not other e-liquid flavors, is associated with use of higher nicotine concentrations. When considered in concert, results from our experimental and survey studies suggest that menthol facilitates the use and liking of e-liquids with higher nicotine concentrations and likely increases risk for addiction. We also have examined the potential impact of banning characterizing menthol flavor among adult cigarette smokers. To model a menthol ban, we had menthol cigarette users switch to non-menthol cigarettes. After switching to non-menthol cigarettes, we observed reductions in smoking heaviness and nicotine dependence and increases in confidence and motivation to quit smoking. Further, we observed the impact of these changes may be greater for Black smokers who had a larger reduction in cigarettes smoked per day after switching to non-menthol cigarettes. Finally, earlier evidence from our group observed an association between use of menthol cigarettes and higher rates of marijuana smoking among youth; we recently extended these findings to use of e-cigarettes and observed that menthol e-liquid use among adolescents similarly conferred risk for marijuana use. Collectively, this evidence suggests that removal of menthol flavor from cigarettes and e-cigarettes could reduce the appeal and abuse potential of tobacco products and also influence marijuana use behaviors.

FUNDING: Federal

SYM16C

CANNABIS BLUNT SMOKING AND INITIATION OF TOBACCO PRODUCTS AMONG US YOUTH AND YOUNG ADULT

Brian J. Fairman, Ph.D., Heather Kimmel, Carlos Blanco, Wilson M. Compton. National Institute on Drug Abuse.

Background: Blunts are a common method of tobacco and cannabis co-use in the United States in which cannabis is rolled in a cigar shell. The extent to which blunt smoking influences the risk of trying other tobacco products is unclear. We estimated lifetime prevalence of blunt smoking among youth and if it was associated with future initiation of cigarettes, e-cigarettes, cigars, and cigarillos. We explored differences by age, sex, and race/ethnicity. Methods: Longitudinal analysis of Waves 1-4 (2013-18) of the prospective, nationally representative Population Assessment of Tobacco and Health (PATH) Study. Participants are youth and young adults aged 12-24-year-old at Wave 1 (n=15,549). The main outcomes were initiation of cigarettes, e-cigarettes, and cigars or cigarillos at Waves 2-4. The key explanatory variable was ever use of blunts, cannabis-only, or neither at Wave 1. Results: Lifetime blunt smoking prevalence was 20.9% with higher prevalence among Blacks (24.9%), males (23.8%), and 18-24-year-olds (31.5%) compared to Whites (20.2%), females (17.8%), and 12-17-year-olds (7.7%). Youth and young adults who smoked blunts were more likely to initiate cigarettes (odds ratio, OR=1.7; 95% confidence interval (CI), [1.3, 2.4]), e-cigarettes (OR=1.6; 95% CI, [1.3, 2.0]), cigars or cigarillos (OR=1.7; 95% CI, [1.1, 2.5]), and any three of these tobacco products (OR=2.8; 95% CI [1.9, 4.1]) compared to those who did not use blunts or cannabis. Youth and young adults who used cannabis-only were similarly more likely to initiate tobacco. Blacks who smoked blunts/cannabis were more likely than other racial groups to initiate these tobacco products. Conclusions: About 1 in 3 US young adults and 1 in 13 youth have smoked blunts, which are associated with an increased risk of initiating cigarettes, e-cigarettes, cigars, and cigarillos within 1-3 years. Communities with higher rates of youth and young adult blunt/cannabis use might also see higher rates of tobacco product initiation.

FUNDING: Federal

SYM17A

A SMARTPHONE-SMARTCARD IMPLEMENTATION OF CONTINGENCY MANAGEMENT FOR SMOKING CESSATION

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Contingency Management (CM) is an operant conditioning/behavioral economics paradigm for drug use cessation. After a half-century of research (>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 during treatment and at long-term follow-up. Despite this evidence base, adoption of CM is poor. Concerns abound regarding the ethics of paying patients money, sourcing 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) automates 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. In 60 pregnant smokers recruited from across the U.S., at early pregnancy assessment, 14 of 30 (46.7%) quit with incentives, vs. 6 of 30 (20%) with best practices behavioral services (p < 0.05). At the late pregnancy assessment, 11 of 30 (36.7%) quit with incentives vs. 4 of 30 (13.3%) 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 commercial and Medicaid payer interest, sustainability, are becoming feasible. Results can match outcomes previously found with grant-funded random controlled trials. Telehealth features can serve COVID-19 and other remote access needs.

FUNDING: Federal

SYM17B

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, nearly 900,000 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 include health plans and manufacturing, construction, and transportation industries (among others) where smoking prevalence exceeds the national average and treatment is often underutilized. This presentation highlights the importance 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 reach to diverse and underserved populations, effectiveness, and population impact will be presented. Methodological considerations related to research design and analytic approaches to advance the science of digital interventions will be discussed.

FUNDING: Federal



SYM17C

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. 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. The current COVID-19 pandemic has augmented these barriers, widening the gap of this health disparity, and the need for novel and effective models to deliver remote smoking cessation interventions to this population. Therefore, digital therapeutics hold 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 and the design of our efficacy trial 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 clinical trial design recommendations, 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

SYM17D

REGULATION OF MEDICAL DEVICES IN A DIGITAL HEALTH ERA

John Marler, MD, Patrick Antkowiak. Center for Devices and Radiological Health, Food and Drug Administration.

FDA defines digital health technologies as products that use computing platforms, connectivity, software, or sensors for healthcare and related uses. In recent years, FDA has seen increasing interest in applying these technologies to deliver medical care. The current regulatory paradigm is designed to align the software development lifecycle and allow for iterative changes that improve the performance of algorithms while improving safety and effectiveness. FDA has started a pilot Software Precertification Program and published a discussion paper outlining a potential approach to regulation of artificial intelligence and machine learning technologies. To support manufacturers in understanding the regulatory status of digital health products in development, FDA has established multiple educational tools and mechanisms for interacting with FDA staff. There are guidance documents to guide those developing these devices through the regulatory processes. FDA encourages early interaction with manufacturers of regulated digital health products. Early interaction is critical to supporting innovation and the development of high-quality software-based medical devices. Manufacturers can interact with FDA staff throughout the product development lifecycle.

SYM18A

MANY COUNTRIES HAVE A MINIMUM BUT NO MAXIMUM CIGARETTE PACK SIZE: THE POLICY GAP BEING EXPLOITED FOR MARKET GAIN

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Many countries have introduced a minimum cigarette pack size – often 20 cigarettes – to reduce the affordability of smaller packs and discourage youth smoking; very few countries have specified a maximum pack size. Larger and non-standard sizes are becoming

more common in response to tobacco control policies (e.g., standardised packaging). However, larger pack sizes are associated with increased tobacco consumption, which in turn is associated with reduced cessation. Due to a lack of experimental evidence, it is not clear whether there is a causal relationship between pack size and consumption, or whether the association is due to motivation to stop smoking, nicotine dependence or affordability (per stick or per pack). We aimed to estimate the impact of reducing pack sizes from 25 to 20 cigarettes on consumption. In an adaptive parallel group RCT, we randomised smokers (who purchase packs of 25) in Australia to use only packs of 20 (intervention), or their usual packs (control), for four weeks. The primary outcome was the average number of cigarettes smoked per day. An interim sample size re-estimation was conducted when 124 participants had been randomised, which suggested 1122 additional randomised participants were required, exceeding prespecified stopping criteria for feasible recruitment. Data collection was terminated accordingly. It remains unclear whether reducing pack size reduces consumption (cigarettes smoked per day: intervention M=15.9, SD=8.5; control M=16.8, SD=6.7; difference -0.9, 95%CI=-4.3, 2.6). The limitations identified in this study were used to inform a more efficient randomised crossover trial, which is currently underway in Canada. While ongoing research efforts explore the nature of the relationship between pack size and consumption, the attention of policymakers is required now to address the lack of regulation concerning maximum pack sizes, which is being exploited by industry to promote brands and undermine tax increases. Understanding the underlying mechanisms will be important for selecting an optimum size that balances affordability (minimum size), quantity available (maximum size), and marketing potential (range).

FUNDING: Nonprofit grant funding entity

SYM18B

VERY LOW NICOTINE CONTENT (VLNC) CIGARETTES: ANTICIPATED BENEFITS AND POTENTIAL UNINTENDED CONSEQUENCES

Clifford Douglas, JD. University of Michigan.

Despite progress, smoking remains the leading cause of premature death in the U.S. and globally. Nicotine addiction has long fueled the tobacco epidemic, and cigarette manufacturers have for decades deliberately dosed consumers with fine-tuned deliveries of the drug. These facts inform the proposal to eliminate the addictiveness of combustible tobacco products, which cause as much as 98% of all tobacco-related deaths in the U.S., by allowing the sale of only very low nicotine content (VLNC) combustible products. Research demonstrates that rapidly reducing nicotine content can substantially reduce nicotine addiction. The Food and Drug Administration's (FDA's) 2017 framework for regulating tobacco products recognizes a continuum of risk across different nicotine-delivery products and posits that reducing the addictiveness of combustible products, while increasing access to less harmful tobacco and nicotine products, will greatly improve public health. The FDA estimates doing so could prompt 5 million adult smokers to quit within one year – rising to 13 million in 5 years – prevent more than 33 million youth and young adults from becoming regular smokers in this century, and save more than 8 million lives. Vulnerable populations would particularly benefit, as smoking is concentrated among individuals with mental illness, with substance use conditions, from lower education and/or socioeconomic groups, from certain racial/ethnic groups, and in the military. Concerns have been raised regarding several potential unintended consequences of drastically reducing nicotine content in cigarettes, including: 1) smoker compensation, 2) illicit trade, 3) consumer misunderstanding about harms of VLNC cigarettes, 4) negative side effects for those with behavioral health disorders, and 5) adulteration of VLNC cigarettes to increase nicotine content. The likelihood of such unintended consequences occurring and, if so, their impact on the projected public health benefits of VLNC policies will be discussed.

FUNDING: Unfunded

SYM18C

LIMITS ON E-CIGARETTE NICOTINE CONCENTRATION IN MARKETS WITH OPEN-SYSTEM DEVICES: THE INTERACTION OF NICOTINE CONCENTRATION AND DEVICE POWER ON E-CIGARETTE ABUSE LIABILITY

Andrew Barnes, PhD, Rose Bono, Rebecca Lester, Cosima Hoetger, Megan Underwood, Augustus White, Caroline O. Cobb. VCU Center for the Study of Tobacco Products.

Background: Open-system e-cigarettes allow users to modify device characteristics such as power, potentially increasing nicotine and toxicant delivery. Regulations to limit e-cigarette nicotine concentration, like those imposed in the European Union's



Tobacco Products Directive (TPD; 20 mg/ml limit), may have unintended consequences in markets where open-system devices are available. We examined the abuse liability of e-cigarette devices across nicotine content and power settings in exclusive e-cigarette and dual users of cigarettes and e-cigarettes. We hypothesized that limiting the amount of nicotine available could reduce abuse liability, but that these reductions may be offset when low-nicotine liquid is paired with a high-powered device. **Methods:** In a clinical laboratory study, we recruited n=19 exclusive e-cigarette users and n=17 dual users ages 21-55. Exclusive e-cigarette users reported daily e-cigarette use and no past-month cigarette use. Dual users reported daily use of cigarettes and someday use of e-cigarettes or vice versa. Participants completed four Latin-square ordered conditions that varied by device power (15 vs. 30 watts) and whether nicotine content in the open-system e-cigarette (SUBOX Mini C) was above (30 mg/ml) or below (10 mg/ml) the TPD limit, and an own brand condition. The progressive ratio task (bar presses, number of puffs earned) was used to assess abuse liability and compared between conditions using linear mixed effects models. **Results:** In the progressive ratio task, significantly more bar presses and puffs were taken during the low-nicotine, high-watt condition compared to own brand (ps<0.05). These outcomes were also higher in the low-nicotine, high-watt condition than in the high-nicotine, high-watt or high-nicotine, low-watt condition (ps<0.05). These significant differences appeared driven by exclusive e-cigarette users. **Conclusions:** Nicotine concentration and power work in tandem to influence abuse liability, particularly for exclusive e-cigarette users. Policies limiting nicotine content in markets with open-system e-cigarettes may limit the ability of regulators to achieve their intended public health objectives.

FUNDING: Federal

SYM18D

THE GOOD AND BAD OF FLAVOURED E-LIQUIDS: TWO STUDIES EXPLORING THE EFFECTS OF E-LIQUID FLAVOURING ON CIGARETTE CRAVING IN ADULT SMOKERS AND SUBJECTIVE RESPONSES TO E-LIQUID PACKAGING IN ADOLESCENTS

Angela Attwood, PhD, Maddy Dyer, Abigail Jackson, Jasmine Khouja. University of Bristol.

Electronic cigarettes (e-cigarettes) are a less harmful alternative to cigarette smoking and can help people quit or reduce the number of cigarettes they smoke. However, there are concerns that the assortment of flavours available may encourage young people who do not smoke to start vaping. This has led several countries to establish or consider bans of some flavoured e-liquids. However, a possible unintended consequence of banning flavoured e-liquids is that this may reduce effectiveness of e-cigarettes for smoking cessation. There are several mechanisms by which flavoured e-liquids may promote cessation. These include disrupting the conditioned association between cigarette cues (e.g., smell of tobacco smoke) and creating new associations between the e-liquid flavour and nicotine. Alternatively, flavoured e-liquids may be rewarding in their own right, or simply more pleasant than unflavoured alternatives, and encourage continued vaping. This project comprises two studies. The first will investigate whether flavoured e-liquids reduce cigarette craving to a greater extent than unflavoured e-liquids. Eighty-four adult daily smokers will be randomised in a two-arm experimental design. Participants will replace cigarette smoking with use of an e-cigarette containing either flavoured (fruit or sweet) or unflavoured e-liquid for one week. Primary outcome measures are general cigarette craving across the week-long exposure period and acute cue-elicited cigarette craving. The second study will recruit adolescents (aged 11 to 17 years) to compare pairs of e-liquid packs (flavoured, unflavoured) on measures of positive (e.g., attractiveness) and negative (e.g., health risk) attributes. These studies will further our understanding of the possible effects of e-liquid flavours on adolescents and smoking adults. Importantly, we explore whether there may be positive effects of flavoured e-liquids for smokers. These findings will be important to appropriately inform future policy decisions. If flavoured e-liquids reduce cigarette craving more than unflavoured e-liquids, it may be counter-productive from a public health perspective to ban or restrict flavoured e-liquids.

FUNDING: Federal

SYM19A

VARIABILITY IN EXPOSURE BIOMARKER LEVELS BETWEEN WAVES 1 AND 2 IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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The Population Assessment of Tobacco and Health (PATH) Study provides valuable information on tobacco use and health outcomes through its longitudinal repeated measures, national representativeness, large number of participants, extensive questionnaire, and biomarker measurements of tobacco use and exposure. A stratified probability sample of Wave 1 adults who provided a urine specimen was selected for biomarker analyses, and the sample was selected to represent diverse tobacco product use patterns and never users of any tobacco product. We assessed consistency and continuity of the biomarker data from wave to wave. Better consistency from wave to wave increases the predictive power of associations between biomarkers and health outcomes. We used PATH Study biomarker data from Waves 1 (2013-2014) and 2 (2014-2015) of the Biomarker Restricted Use Files (BRUF) to derive appropriate measures of intensity and recency of tobacco product use and nicotine metabolite ratio (NMR). Biomarker data were log-transformed. A weighted mixed model was used to calculate intra-class correlation coefficients (ICC) at the two time points (Wave 1 and Wave 2). The intra-class correlation of biomarkers of nicotine in the PATH Study indicate good consistency of biomarkers between Waves 1 and 2. These findings support that PATH Study data are an effective tool for evaluating the associations between biomarkers of exposure and product characteristics, tobacco product use behavior, and transitions and helping us better understand their relationship to adverse health outcomes.

FUNDING: Federal; State; Pharmaceutical Industry; Academic Institution; Nonprofit grant funding entity; Other

SYM19B

CANCER RISK ASSOCIATED WITH BIOMARKERS OF CARCINOGEN EXPOSURE AMONG TOBACCO USERS IN THE GOLESTAN COHORT STUDY

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Background: Few prospective studies have examined specific tobacco-related biomarkers and cancer incidence. **Methods:** We conducted a nested case-control study within the Golestan Cohort Study. Cases were individuals who developed lung or esophageal cancer during follow-up (median of 11 years) until Jan 1, 2018. Cancer-free controls were incidence density sampled (2 for lung, 1 for esophagus) matched by age, sex, residence, time in cohort, and self-reported tobacco use (cigarette, waterpipe or nass). We measured 40 biomarkers of exposure in four chemical classes in baseline spot urine samples: tobacco alkaloids, tobacco-specific nitrosamines (TSNAs), polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs). All biomarkers were creatinine-adjusted and analyzed using logistic regression conditioned on the matching factors and adjusted for ethnicity, opiate use, education and wealth score. **Results:** After excluding never tobacco users and tobacco users with a cotinine level below 50 ng/ml, the analytic dataset included 67 cases of lung cancer (122 matched controls) and 62 cases of esophageal cancer (62 matched controls). Cotinine was significantly associated with increased lung cancer risk. While no TSNAs or PAHs were significantly associated with lung cancer risk, several VOCs showed positive associations, including metabolites of 1,3-butadiene, crotonaldehyde, acrolein, acrylonitrile, vinyl chloride, ethylene oxide, N,N-dimethylformamide, and benzene (ORs per unit increase between 1.50 and 1.91, p<0.05). The associations attenuated and became non-significant after cotinine adjustment. There was no significant association between cotinine and esophageal cancer risk. In fully adjusted models including cotinine, two TSNAs (NNAL and NATT) and one VOC (styrene metabolite) were significantly associated with increased esophageal cancer risk (ORs per unit increase between 2.0 and 3.6, p<0.05). **Conclusion:** While associations between several VOCs and lung cancer risk among tobacco users seemed to reflect an individuals' intensity of tobacco exposure, there were significant associations between TSNAs and esophageal cancer beyond overall tobacco exposure.

FUNDING: Federal



SYM19C

OXIDATIVE STRESS AND ISCHEMIC HEART DISEASE (IHD) AND CHRONIC OBSTRUCTION PULMONARY DISEASE (COPD) MORTALITY IN THE GOLESTAN COHORT OF TOBACCO USERS

Carol H. Christensen, PhD, MPH¹, Jia Wang¹, Sapna Thakur¹, Arash Etemadi², Neal David Freedman², Christian Abnet², Sanford M. Dawsey², Mitchell H. Gail², Barry Graubard², Maki Inoue-Choi³, Cory Holder⁴, Lanqing Wang⁴, Ben Blount⁴, Jun Feng⁴, Reza Malekzadeh⁵, Mahd Nalini⁵, Hossein Poustchi⁵, Masoud Khsohnia⁶, Gholamreza Roshandel⁶, Farin Kamangar⁷, Paolo Boffetta⁸, Cindy Chang¹. ¹FDA / Center for Tobacco Products, ²NCI/NIH, ³National Cancer Institute, ⁴CDC, ⁵Digestive Disease Research Institute, Tehran University of Medical Sciences, ⁶Digestive Disease Research Institute, Tehran University of Medical Science, ⁷Morgan State University, ⁸Mount Sinai School of Medicine.

Background: Biomarkers predictive of disease would improve our understanding of new tobacco product health risks. Oxidative stress from exposure to tobacco smoke has a role in the pathogenetic process leading to chronic obstructive pulmonary disease (COPD) and ischemic heart disease (IHD). The urinary metabolite 8-isoprostane is a biomarker of oxidative stress. **Methods:** We conducted a nested case-cohort analysis within the prospective Golestan Cohort Study (GCS) to estimate the relationship between 8-isoprostane concentration and mortality due to IHD and COPD. The GCS enrolled 50,045 Iranian adults ages 40-75 years between 2004-2008 and collected tobacco use data and urine specimens. Mortality was assessed through active follow-up through 2017. At baseline, we selected a stratified random sample of disease-free participants from age (+/- 55 years), sex (male/female), region (urban/rural) and smoking status (yes/no) groups. We measured 8-isoprostane concentration in baseline spot urine samples. We estimated the odds of IHD and COPD mortality by tertiles of creatinine-corrected 8-isoprostane among current cigarette smokers using conditional logistic regression adjusting for socioeconomic status, physical activity, body mass index, opiate use, smoking intensity and smoking duration. The IHD model additionally adjusted for diabetes and hypertension. **Results:** We included 347 participants (cases 179, noncases 168) in the IHD analysis and 235 participants (cases 60, and noncases 175) in the COPD analysis. The risk of IHD did not differ by 8-isoprostane tertile (T1: OR=1.0, T2: OR=0.7 (95% CI 0.4, 1.2), T3: OR= 0.9 (95% CI 0.5, 1.5). In contrast, the risk of COPD was greater in T2 (OR: 1.6, 95% CI 0.6, 4.4), and significantly greater in T3 (OR: 2.9, 95% CI 1.2, 7.4) compared to T1. **Conclusion:** We demonstrate that a baseline measure of an oxidative stress biomarker among smokers is associated with greater mortality risk of COPD, but not IHD, over an average of ten years of follow-up. This is one of the first investigations to link a biomarker measure and smoking-related disease outcomes and informs potential use of biomarkers to predict future disease risk.

FUNDING: Federal

SYM19D

BIOMARKER EVIDENCE IDENTIFYING VITAMIN E ACETATE AS A CAUSE OF E-CIGARETTE, OR VAPING, PRODUCT ASSOCIATED LUNG INJURY (EVALI)

Ben Blount, PhD. CDC.

E-cigarette, or vaping, product associated lung injury (EVALI) first appeared in June 2019 and became a public health crisis in August 2019. As of February 18, 2020, a total of 2,807 hospitalized EVALI cases or deaths have been reported to CDC from all 50 states, the District of Columbia, and several U.S. territories and other countries. Sixty-eight deaths have been confirmed in 29 states and the District of Columbia (as of February 18, 2020). This presentation will describe efforts to develop and apply new analytical methods to measure potentially causal chemicals in bronchoalveolar lavage fluid collected from EVALI cases and comparators. These measurements implicate aerosolized vitamin E acetate as the primary cause of lung injury.

FUNDING: Federal

SYM20A

QUITTING EXPERIENCE OF ADOLESCENT E-CIGARETTE USERS: A QUALITATIVE STUDY

Grace Kong, PhD. Yale University School of Medicine.

Introduction: Adolescents are using e-cigarettes at high rates and there is limited information on how to help them quit. We aimed to understand quit attempt experiences of adolescent e-cigarette users to inform e-cigarette cessation interventions. **Methods:** Six

focus groups with current users (i.e., past-month users) and 2 focus groups with past users (i.e., no past-month users) were conducted in Fall 2019 in Connecticut (N=62; n=4-10 participants per group; 50% female). We used a standardized focus group guide to conduct the focus groups and an iterative approach to identify themes. **Results:** Adolescents used e-cigarettes because of peer-influence and stress-relief and reported disliking e-cigarettes due to the cost and negative health effects. They reported both intentional and unintentional experiences with quitting/cutting down e-cigarette use. Reasons for unintentional quitting included lack of access to e-cigarettes (e.g., losing the device) and reasons for intentional quitting included "tolerance breaks." Of those who tried to quit, common quitting methods were "cold turkey," giving away their device, and limiting interactions with peer users. The most common withdrawal symptom was negative mood. Notable barriers to quitting included peers, being at school, addiction to e-cigarettes/nicotine, easy access to e-cigarettes/e-liquids, and lack of motivation to quit. **Discussion:** Adolescent e-cigarette users identified several factors related to liking/disliking e-cigarettes, quitting experiences including withdrawal, and barriers to quitting including exposure to e-cigarettes in school. This evidence suggests that interventions focused on changing social norms and preventing use of e-cigarettes in school, motivating youth to quit, and managing stress and other withdrawal symptoms are needed.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

SYM20B

E-CIGARETTE CESSATION PROGRAMS: WHAT DO YOUTH WANT?

Krysten W. Bold, Ph.D. Yale School of Medicine.

Significance: E-cigarette use is common among youth and poses risk for nicotine addiction, yet there is limited information about vaping cessation programs for youth. This study aimed to understand youth perceptions and desired characteristics of a school-based vaping cessation program to inform intervention development. **Methods:** We conducted 8 focus groups with high school youth: 6 with youth who were current (i.e., past-month) e-cigarette users and 2 with past users (i.e., lifetime users with no past month use) in Fall 2019 in Connecticut (N=4-10 adolescents per group, total N=62, 48% male). We used a standardized guide to facilitate discussions about desired features and concerns about a quit program and used an iterative approach to identify qualitative themes. We also collected quantitative data from the focus group participants assessing which skills they would want to learn from a vaping cessation program. **Results:** Qualitative themes about desired features included 1) confidentiality (e.g., youth wanted to ensure teachers and coaches would not know about their use); 2) working toward vaping reduction and not only quitting; 3) learning about health effects of vaping, particularly from those with personal experience and anecdotes that they could relate to, and 4) rewards for quitting (e.g., cash). The most frequently endorsed skills that youth wanted to learn included ways to deal with stress (92%), how to relax (60%), and how to deal with poor concentration/attention (55%). Potential issues youth described about implementing a vaping cessation program included 1) perceptions that youth may not want to participate due to lack of interest/apathy, 2) embarrassment or not wanting to be seen as addicted, and 3) a need for methods to limit dishonest reporting (i.e. verification of abstinence). **Conclusion:** Findings identified key features to include and issues to address when developing school-based vaping cessation programs. Developing effective vaping cessation programs that appeal to youth is important for addressing youth e-cigarette use and preventing long-term nicotine addiction.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

SYM20C

DEVELOPING A HEALTHY FUTURES CURRICULUM FOR YOUTH E-CIGARETTE USE

Bonnie Halpern-Felsher, PhD. Stanford University.

Background and Objective With the alarming rise in youth e-cigarette use, engaging educational resources are necessary to inform and advise youth about the potential harms of use, particularly to those caught using on school grounds. The Tobacco Prevention Toolkit (TPT) developed Healthy Futures, activities and interactive materials that provide secondary preventive and cessation messages to be used by schools as an alternative to suspension, and by youth seeking help quitting. **Methods** Based on principles of motivational interviewing and brief intervention, we developed and are currently disseminating and evaluating three versions (1-hour, 2-hours, and 4-hours) of the Healthy Futures curriculum, housed on the Tobacco Prevention Toolkit website. As successfully done in earlier Toolkit materials, we worked with our numerous school and community partners. The curriculum was developed and pilot tested with two high school classes and 1 peer educator training for their review. **Results** Preliminary results



to date, through Google analytics, show Healthy Futures is popular and an often-visited page on the TPT website. We have conducted 25 trainings with over 1000 educators, with over 223,000 students reached so far. Google analytics show that we have over 7,000 page views. Pre- and post-curriculum data are currently being collected. Conclusions With the addition of Healthy Futures, we will rapidly and effectively reach hundreds of thousands of youth who are currently using e-cigarettes, providing critical resources to help them stop using.

FUNDING: Nonprofit grant funding entity

SYM20D

WHO, WHAT, WHEN, WHERE, AND WHY? NOVEL INSIGHTS ABOUT YOUNG PEOPLE WHO VAPE FROM A TEXT MESSAGE CESSATION PROGRAM

Mia M. Bottcher, BS. Innovations Center, Truth Initiative.

Introduction: In January 2019, Truth Initiative launched This is Quitting (TIQ), a first-of-its-kind text message vaping cessation program for young people. Few studies have characterized the population of young people who vape and want to quit. These analyses provide rich insights on nearly 200,000 teens (13-17) and young adults (18-24, YA) enrolled in TIQ to date. Methods: Upon enrollment, users answer a series of questions to tailor the program (e.g., age, device type, substance vaped, amount vaped, changes in vaping due to COVID). To drive engagement, interactive messages ask about reason for quitting, perceived social support, and previous quit attempts. Data were downloaded from our messaging platform and de-identified prior to descriptive analyses in RStudio. Results: WHO: 60% of users are (YA), 40% are teens. 57% vape nicotine only, 38% vape both nicotine and marijuana. 89% reported previous quit attempts, and 58% vaped 28-30 days of the last 30. WHAT: JUUL use dropped from 75% in Sept 2019 to 61% in Oct 2019, straddling federal policy on flavors. WHEN: Major triggers were seeing others vaping (30%), being with friends (19%), and stressful/emotional situations (15%). 79% reported no change in vaping as a result of COVID-19. WHY: Top three reasons for quitting vaping were health concerns (50.9%), cost (21.7%) and desire to be free from addiction (16.0%). Teens were less likely to report support from peers for quitting compared to YAs (60% vs. 70%) and more likely to report their parents were unaware of their vaping (52% vs. 42%). HOW: Top three types of support for quitting desired by young people are emotional support (35%), decreasing exposure (16%), and accountability (12%). Conclusion: These data and others that will be shared in this symposium provide key insights into the demographics, tobacco use patterns, and motivational characteristics of young e-cigarette users enrolled in a quit vaping program. Novel and timely data collection via TIQ allows for extensive intervention tailoring and informs intervention development and optimization. These insights are critical for engaging the more than 5 million young people who vape in cessation efforts.

FUNDING: Nonprofit grant funding entity

SYM20E

REACH, ENGAGEMENT AND CESSATION IN THE MY LIFE, MY QUIT YOUTH TOBACCO QUITLINE PROGRAM

Thomas Ylloja, PhD, MSW. National Jewish Health.

Significance: Telephone quitlines have low reach with youth (age <18) despite the rapid rise in tobacco use. My Life, My Quit TM (MLMQ) was developed as a youth-tailored quitline program to address this service gap. While implementing best practices in quitlines, innovation includes ability to engage with a cessation coach using live text messaging or online chat. While telephone quitline, online and interactive text programs are evidence-based, the impact of a youth-tailored multi-modal quitline program on reach, engagement, and cessation efficacy is unknown. Methods: National Jewish Health, a multi-state quitline operator, delivers MLMQ in 20 states across the United States. We evaluated reach by number of new enrollments compared to the prior year. We evaluated engagement in the interactive online and live coaching programs using the number of program contacts (sum of web logins, phone, text and chat coaching sessions). Seven-day point prevalence abstinence was measured at 3- (response rate (RR)=23.5%) and 7-months (RR=22.5%) after enrollment by electronic survey sent in a text message from May-July 2020 to youth who agreed to surveys. Results: In the first year 1287 youth enrolled, representing a 284% relative increase compared to the prior year. The interactive online program was used by 64%, with an average of 1.6 contacts. Participants engaged in live coaching (+/- online and text) by phone only (17%, 3.4 contacts), text/chat only (5%, 2.7 contacts), and multiple methods (1%, 4.4 contacts). An additional 8% used automated text only, and 5% did not engage. From youth who consented to survey (58% of all), self-reported responder (intent-to-treat) abstinence at 3-months was 66% (15%) and 70% (16%) at 7-months. Conclusion: A

youth-tailored program increased quitline reach, and youth participants engaged with the interactive online program and in live coaching by phone, text and chat. Abstinence rates demonstrated program effectiveness. Future research should explore program components associated with cessation.

FUNDING: Unfunded

SYM21A

ESTIMATING SMOKING HISTORY TRENDS BY STATE IN THE US, 1920-2018 USING NATIONAL SURVEYS OF EXPOSURE

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Significance: Tobacco use patterns differ greatly by state and it is essential to understand each state's historical patterns to see the impact of current policies and the varying effect of new policies in these unique settings. The smoking history generator (SHG) was developed by the Cancer Intervention and Surveillance Modeling Network (CISNET) to assist in developing US simulation models for exploring effects of tobacco policies on lung cancer and mortality. This study extends the SHG to further characterize smoking histories specific to each of the 50 states and Washington, DC. Methods: An age-period-cohort modeling method was developed to combine detailed temporal data on exposure from the National Health Interview Survey (NHIS) 1965-2018, with state-level information from the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) 1993-2018. The NHIS provides a time span for calibrating the effect of differential smoking related mortality on estimates from the past, and these estimates are used for calibrating state-specific estimates of temporal trends from TUS-CPS. This process yields sex-specific estimates of smoking initiation and cessation probabilities by single years of age and calendar years since 1920 for each state. Prevalence for current, former, and never smokers, and smoking intensity are also estimated. Results: State-specific estimates show the variability of smoking history trends across the US, as well as state-level differences in exposure (i.e., smoking duration, pack-years), number of premature deaths, and years of life lost. Under a status quo assumption in which current behavior patterns do not change after 2018, disparities by state continue. For example, while future smoking prevalence in Arkansas is projected to decrease over time, the decline for California will be greater. Conclusions: Trend differences may result from variations in tobacco control policy environments or cohort differences by state. These estimates detail the unique smoking history experiences within each state and can be used to assess the potential effects of tobacco control interventions on health outcomes for state populations.

FUNDING: Federal

SYM21B

BIRTH COHORT-SPECIFIC SMOKING PATTERNS BY SOCIOECONOMIC AND SOCIODEMOGRAPHIC FACTORS IN THE US

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Background: Disparities in smoking prevalence across different sociodemographic groups persist. While overall smoking patterns vary strongly by birth cohort, little is known about how smoking trends vary by cohort across sociodemographic groups. Methods: Using the 1965-2018 National Health Interview Surveys, we developed age-period-cohort models and estimated the annual probabilities of smoking initiation, cessation, and intensity by sex and birth-cohort among different racial/ethnic groups (non-Hispanic Whites (NHW), non-Hispanic Blacks (NHB), Hispanics, American Indians and Alaskan Natives (AIAN), and Asians and Pacific Islanders (API)), educational levels (=8th grade, 9-11th grade, high school graduate or GED, some college, and at least a college degree), and income-to-poverty ratio groups (<1, 1-2, 2-3, 3-4 and 4+ times the poverty threshold). Results: The age-specific initiation probabilities among NHB have historically been similar to those of NHW but have rapidly decreased by birth cohort. Cessation probabilities were lowest among AIAN and NHB, and highest among NHW and API. Initiation probabilities were highest among individuals with 9-11th grade education and lowest among those with a college degree. Initiation probabilities among individuals with =8th grade education have decreased by birth cohort, resulting in this group having the second lowest smoking prevalence after individuals with a college degree in recent birth cohorts. Cessation probabilities were highest among individuals



with a college degree. Initiation probabilities were highest among individuals living below the poverty threshold, while cessation probabilities were lowest among this group. Initiation probabilities decreased and cessation probabilities increased with higher levels of income. Smoking prevalence has been decreasing in all income groups; however, income disparities are increasing with more recent birth-cohorts. Conclusions: Strategies to reduce tobacco-related health disparities should account for differences in age-specific initiation and cessation rates by sociodemographic factors and consider changing patterns by cohort.

FUNDING: Federal

SYM21C

A SIMULATION MODEL OF SMOKING, ENDS USE, AND HEALTH OUTCOMES AMONG US BLACKS

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Introduction: Simulation models have played a critical role in advancing US tobacco control policies. Most models have focused on the overall population, ignoring sub-populations affected by disparities. In particular, there are no models for specific racial groups. Here we present a new simulation model for smoking and ENDS use among US non-Hispanic Blacks (NHBs). **Methods:** We apply and extend the approaches developed by the Cancer Intervention and Surveillance Modeling Network (CISNET) Lung group to create a US NHB microsimulation model of smoking and ENDS use by sex and birth-cohort. To derive model parameters, we analyzed historical smoking data from the NHIS 1978-2018, historical black mortality data from the CDC 1969-2017, and data on smoking and ENDS transitions from Waves 1-4 of PATH. Parameters include rates of smoking and ENDS initiation, cessation, intensity, transition rates, and mortality rates by smoking status by sex, age and birth-cohort. The model simulates individual histories of smoking and ENDS use from 1969-2100. We project the burden of smoking on NHB under a Status Quo (SQ) scenario and estimate the Maximum Potential Reduction in Premature Mortality (MPRPM) that could be achieved if all NHB smoking ceased in 2020. **Results:** Estimated smoking initiation and cessation rates show that NHBs have lower initiation occurring at later ages and lower cessation rates compared to the general population. These patterns result in longer durations of smoking for NHB versus Whites and other groups. Modeling analyses suggest that under a SQ scenario, 1.54 million smoking attributable deaths (SADs) and 21.3 million Years of Life Lost (YLL) would occur among NHB in the US from 2010-2100. The MPRPM that could be achieved is 11.2 million YLL (52% of the SQ). As currently used, ENDS would have limited impact on NHB mortality. **Conclusions:** We present the first tobacco simulation model developed for NHBs. Our work highlights the challenges and data gaps that need to be overcome to develop tobacco simulation models for specific populations. Our findings suggest that under current patterns of use, smoking will continue to have a considerable impact on NHB mortality.

FUNDING: Federal

SYM21D

AN ESTIMATION OF THE HARM OF MENTHOL CIGARETTES IN THE UNITED STATES FROM 1980-2018: A SIMULATION ANALYSIS

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Introduction: Menthol cigarettes are thought to encourage smoking initiation among youth and young adults, and make it more difficult for smokers to successfully quit smoking. However, to date, no study has quantified the harm that menthol cigarettes have caused the US population. In this work, we estimate the extra smoking prevalence, initiation and the associated mortality that can be attributed to menthol cigarettes in the US from 1980 to 2018. **Methods:** Using a well-established simulation model of smoking prevalence and health effects and data from the National Health Interview Survey, we first calibrated the model to reproduce the overall US adult smoking prevalence from 1980 to 2018 (pseudo $R^2 = 0.98$) and associated mortality. Then we used the same model to calculate similar outputs over the same period, assuming that menthol cigarettes were not available in the market. Finally, we compared both scenarios to estimate the public health harm due to menthol over 1980-2018. **Results:** From 1980 to 2018, in the absence of menthol cigarettes, the overall smoking prevalence in the United States population would have declined from 33.2% to 11.1%, compared to the observed 33.2% to 13.7%. Our results also show that menthol in cigarettes is responsible for 10.1 million extra smokers, 4.3 million life-years lost, and 385000 premature deaths during that period. **Conclusions:** With a significant proportion of new smokers and smoking-related deaths

due to mentholated cigarettes during 1980 - 2018, we show that menthol cigarettes have had a large detrimental impact on the public's health which is likely to continue into the future. Our results will support the FDA in their evaluation of potential regulatory actions on mentholated cigarettes.

FUNDING: Federal

SYM22A

CHARACTERISTICS OF A NATIONWIDE OUTBREAK OF E-CIGARETTE, OR VAPING, PRODUCT USE-ASSOCIATED LUNG INJURY (EVALI) – UNITED STATES, AUGUST 2019-FEBRUARY 2020

Christina Watson, DrPH, Teresa Wang, Dayna Alexander, Briana Oliver, Christopher Dunphy, Nisha Nataraj, Katrina Trivers, Ahmed Jamal. CDC.

Objective: From August 2019 to February 2020, public health stakeholders investigated a nationwide outbreak of e-cigarette, or vaping, product use-associated lung injury (EVALI). This presentation will summarize the final case data reported by states, including characteristics of cases, course of illness and hospitalizations, and substance use. **Methods:** States and jurisdictions voluntarily reported data on confirmed and probable hospitalized or deceased EVALI patients to CDC weekly using established case definitions and data collection tools. Self-reported e-cigarette, or vaping, product use data was collected, including substances used, frequency of use, and product source, as well as demographic characteristics of hospitalized cases, and length of hospitalization and deaths. ANOVA analyses for hospitalization data were completed using SAS software, version 9.4. **Results:** As of February 21, 2020, 2,807 hospitalized EVALI cases, including 69 deaths, had been reported to CDC. Among EVALI cases with available data on substance use ($n = 2,415$), 78% reported using any tetrahydrocannabinol (THC)-containing e-cigarette, or vaping, products (33% reported exclusive use), and 56% reported using any nicotine-containing products (14% reported exclusive use). Older age was significantly associated with longer hospital stays; persons 45 years of age or older had a median length of hospitalization of 6 days (versus 5 days for those <45 years of age). Those reporting exclusive THC-containing product use had longer hospitalization stays (median 5 days) compared to exclusive nicotine product users (median 4 days). **Conclusions:** CDC recommends that persons not use THC-containing e-cigarette, or vaping, products, particularly those obtained from informal sources such as friends, family, or in-person or online dealers. Vitamin E acetate has been strongly linked to the EVALI outbreak, and should not be added to any e-cigarette, or vaping, products. However, evidence is not sufficient to rule out the contribution of other chemicals of concern, including chemicals in either THC- or non-THC-containing products, in some of the reported EVALI cases.

FUNDING: Federal

SYM22B

CHEMICAL ANALYSES OF AEROSOL EMISSIONS FROM EVALI CASE-ASSOCIATED E-CIGARETTE, OR VAPING, PRODUCTS

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Objective: CDC began receiving lung injury reports - later identified as e-cigarette, or vaping, product use -associated lung injury (EVALI) in August 2019. Initial clinical findings suggested a lipid-type pneumonia. Potential causative agents included diluents, solvents, additives, medium chain triglycerides, and vitamin E acetate (VEA). Little was known about the inhalation consequences of these chemicals, including if they transferred directly to the aerosol, or thermally degraded upon vaping with harmful chemicals being generated and transported via the resulting aerosol to the users' lungs. **Methods:** CDC analyzed the aerosol chemistry of e-cigarette, or vaping, products obtained from cases to help augment a concurrent chemical analysis of the liquid contents by FDA and state public health laboratories. A total of 175 case-related and 19 non-case-related samples were aerosolized using a standard puffing regimen and quantitatively analyzed for VEA and related tocopherols, squalene, squalane, terpenes, nicotine, humectants, cannabinoids, volatile organic compounds, hydrogen cyanide, carbonyls, metals, and triglycerides. **Results:** In summary, we found that VEA was detected in 46% of the samples analyzed; THC was detected in 74% of samples analyzed; and nicotine was detected in 28% of the samples. The amount of specific chemicals varied, but maximum aerosol deliveries for VEA, THC, and nicotine were 74.1, 42.2, and 3.2 micrograms per mL of aerosol volume, respectively. **Conclusions:** Our results confirm the presence of



VEA in case-associated e-liquids and that it efficiently transfers to the aerosols during the vaping process. The findings provide a valuable benchmark measure of chemicals present in aerosol emissions of EVALI case-associated devices.

FUNDING: Federal

and motivations for use, can inform prevention efforts. Understanding differences in use behaviors by statewide marijuana legalization status can help inform prevention and education strategies.

FUNDING: Federal

SYM22C

OUTBREAK: CALIFORNIA'S EVALI MEDIA CAMPAIGN IMPACT ON YOUNG ADULTS

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Objective: In response to the Executive Order on EVALI issued by Governor Newsom in September 2019, the California Department of Public Health, Tobacco Control Program, launched the Outbreak campaign in October 2019. Outbreak consisted of TV, digital, and radio ads, targeting young adults and parents to raise awareness of the EVALI outbreak and the teen vaping epidemic. **Methods:** The Outbreak evaluation was part of the overall CA media campaign evaluation that includes a monthly survey of approximately 3,000 CA residents and 1,200 remainder of US residents (ROUS) age 19-55. Evaluation questions focused on ad recall and beliefs related to vaping and EVALI. This analysis examined differences in trends in campaign-targeted beliefs among young-adult (ages 19-34) vape users and non-users in CA and ROUS from October 2019-February 2020. Data were collected in 7 waves with some measures collected in a subset of waves. The sample included 7,029 Californians (28.8% self-identified vape users) and 2,201 ROUS (27.4% vape users). Logistic and linear regressions were used to test trends. **Results:** Outbreak recall was 58.3% among all young adults. The perception that vaping marijuana is harmful increased among CA vapers (W3-W7; trend $p < .05$), but not among non-users or among vapers in the ROUS. Belief that vape flavorings are harmful to lungs increased among CA vapers (W1-W7; 65.5% vs. 80.8%; $p = .09$). While positive feelings among CA vapers toward the vaping industry increased from before vs. during/after the campaign (W1-W7; 63.7% vs. 73.2%; $p = .06$), the belief that youth can easily use vapes without being caught decreased (W1-W7; 77.9% vs. 66.6%; $p < .05$). Belief that vape products may cause serious lung illness also increased over time among ROUS vapers (trend $p < .05$). **Conclusions:** Outbreak reached a substantial proportion of young adults in CA. While there were some significant changes in young adult vapers' perceptions about EVALI and potential injury sources (i.e., flavors), more counter measures are needed to diminish positive attitudes toward the vaping industry. Further analysis of these data on vape use and EVALI will help inform these additional countermeasures.

FUNDING: State

SYM22D

AFTER THE E-CIGARETTE, OR VAPING, PRODUCT USE-ASSOCIATED LUNG INJURY (EVALI) OUTBREAK: NOW WHAT?

Katrina Trivers, PhD, MSPH, Christina Watson, Linda Neff, Christopher Jones, Karen Hacker. CDC.

Objective: Identify tetrahydrocannabinol (THC)-containing e-cigarette, or vaping, product use behaviors after the 2019 E-cigarette, or Vaping, Product Use-Associated Lung Injury (EVALI) outbreak. **Methods:** Data on self-reported use of THC-containing e-cigarette, or vaping, products (EVP) in the past 3 months came from an internet survey conducted between February and March 2020. Respondents ($n=3980$) were selected from the YouGov panel, an opt-in panel of 1.2 million US residents. Inclusion criteria were: 1) age 18 years or older; 2) used nicotine- and THC-EVP in past 3 months; 3) no diagnosis of EVALI in past year; and 4) reside in 18 geographical diverse states. Correlates of daily versus non-daily THC EVP use were analyzed using logistic regression. **Results:** Fifty-three percent of respondents used prefilled cartridge-based THC-containing EVPs, 37.9% used a tank system, and 33.2% used disposable EVPs. Sources where respondents reported obtaining their THC-containing EVPs included: recreational dispensary (41.1%), a friend or family member (38.6%), vape/smoke shop (38.4%), an illicit dealer (15.1%), and online (7.4%). Almost one-fourth (23.5%) used THC-containing EVPs daily, 23.0% weekly, 18.6% a few days per month, and 34.7% monthly or less. Respondents between 45-64 years of age had lower odds of reporting daily use compared to those 25-34 years of age [OR (95% CI) = 0.73 (0.60-0.90)]. Compared to White respondents, Asian respondents had lower odds [OR (95% CI) = 0.55 (0.36-0.84)], and Black respondents had higher odds [OR (95% CI) = 1.48 (1.17-1.86)], of reporting daily use daily. Those living in legalized-marijuana states were more likely to use THC EVPs daily than those living in non-legalized states [[OR (95% CI) = 1.18 (1.01-1.37)]. **Conclusions:** Among THC EVP users, almost 47% report daily or weekly use, and products are accessed through both informal and formal sources, even after the EVALI outbreak. Continued surveillance to track use behaviors, product sources,



PODIUM PRESENTATION 1

PAPER SESSION 1: MENTAL DISTRESS, MENTAL HEALTH, AND SMOKING

POD1-1

THE IMPACT OF COPING WITH STRESSFUL EVENTS ON NEGATIVE AFFECT AND CRAVINGS AMONG SMOKERS WITH MOOD DISORDERS

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Significance: Craving to smoke is a key precipitant of lapse following a quit attempt. While coping with stress has been shown to reduce craving to smoke, the impact of stress coping on negative affect and craving among smokers with mood disorders has not been studied. The current study investigated whether coping with stress predicts lower subsequent craving through its effects on negative affect among smokers with mood disorders during a quit attempt. **Methods:** Participants were 39 treatment seeking smokers with mood disorders receiving outpatient psychiatric treatment who participated in a randomized controlled trial of a smartphone-assisted mindfulness-based smoking cessation intervention. Participants were prompted to complete an ecological momentary assessment (EMA) survey 5 times daily. We utilized near real-time data from EMA reports after the target quit date (4 weeks after baseline) to conduct within-subject analyses. We investigated the impact of coping (i.e., report of having coped if participant encountered a stressful event) on subsequent negative affect (i.e., average rating of anger, sadness, guilt, and anxiety) and craving (i.e., rating of desire to smoke) within individuals. **Results:** Multilevel models revealed that stress coping predicted lower craving through reductions in negative affect in the contemporaneous model where all variables were assessed at the same EMA report. However, stress coping did not prospectively predict craving measured at the next report, up to 12 hours later. **Conclusions:** Coping with stress may reduce craving through reducing negative affect in the context of smoking cessation among smokers with mood disorders, but only within a limited period of time (i.e., when craving was assessed at the same report as coping). This suggests that craving may fluctuate throughout the day and be influenced by other proximal factors. This study was the first to use EMA data to examine the effect of stress coping on craving among smokers with psychiatric disorders. Future studies that investigate the extent of the impact of stress coping on affect and craving as well as other potential pathways of the effects of coping are needed.

FUNDING: Federal

POD1-2

SMOKING TRAJECTORIES FROM ADOLESCENCE TO EARLY ADULTHOOD AS A LONGITUDINAL PREDICTOR OF MENTAL HEALTH IN LATER ADULTHOOD

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Significance: Although the association between smoking trajectory and subsequent adverse physical health outcomes have been well documented, little is known about how smoking trajectory in the developmentally critical period (i.e., adolescence and young adulthood) predicts mental health in later adulthood. **Methods:** Data were drawn from Round 1 to Round 18 of the National Longitudinal Survey of Youth 1997 that have interviewed a representative cohort of Americans born between 1980 and 1984 (N=8,570) 18 times from 1997 to 2017. Group-based multi-trajectory modeling was performed to identify smoking trajectories over 10 years from adolescence to young adulthood. We conducted the multiple linear regressions to estimate the relationship between the smoking trajectories (Round 1 to Round 11) and mental health in later adulthood (Round 18). In addition, we examined potential mediation of alcohol and marijuana use in Round 12 to Round 17. **Results:** Late-onset moderate smokers ($\beta=-1.95, p=.021$), late-onset accelerated smokers ($\beta=-2.53, p=.005$), early-onset heavy smokers ($\beta=-3.72, p<.001$), and early-onset moderate smokers ($\beta=-2.66, p=.004$) showed significantly poorer mental

health in later adulthood than stable abstainers, even after controlling for baseline mental health condition and covariates. The mental health score of quitters was not significantly different from that of stable abstainers. The use of alcohol and marijuana in adulthood mediated the association between the smoking trajectory (late-onset moderate smoking: 30.4% mediated, late-onset accelerated smoking: 28.1% mediated, early-onset heavy smoking: 16.7% mediated, early-onset moderate smoking: 32.7% mediated) and poor mental health. **Conclusions:** Our findings provide population-based empirical evidence that continued smoking from adolescence to young adulthood, especially early-onset and heavy smoking, may have a long-lasting negative impact on mental health and that quitting may mitigate such impact. To promote mental health, we need to prevent adolescents and young adults from using tobacco products.

FUNDING: Unfunded

POD1-3

INVESTIGATION OF BIDIRECTIONAL RELATIONSHIP BETWEEN TOBACCO USE AND MENTAL HEALTH PROBLEMS AMONG ADOLESCENTS

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Significance: Despite the high comorbidity of tobacco use and mental health problems, our understanding of directionality underlying the comorbidity is still limited, especially regarding the use of electronic cigarettes (e-cigarettes). This study aimed to elucidate the temporal order of the longitudinal relationship between different types of tobacco use and mental health problems in adolescence. **Methods:** We analyzed data from Wave 1 to Wave 4 of the youth cohort of the Population Assessment of Tobacco and Health study (N=10,082), using cross-lagged panel models. **Results:** After controlling for the autoregressive paths and covariates, high level of internalizing problems at Wave 1 predicted tobacco use at Wave 2, but not vice versa. Tobacco use at Wave 2 tended to persist into late adolescence or young adulthood (Wave 3), which, in turn, increased the risk of subsequent internalizing problems at Wave 4. These temporal order (i.e., mental health problems \rightarrow tobacco use \rightarrow persistent mental health problems) were consistently observed in both e-cigarette and conventional cigarette use. Mental health problems did not predict dual use of conventional cigarettes and e-cigarettes, but dual use significantly increased the risk of subsequent internalizing problems. **Conclusions:** Our findings suggest that internalizing problems are a strong prospective predictor of e-cigarette or conventional cigarette use among adolescents and that such nicotine product use exacerbates or develops internalizing problems after regular use. Our findings underscore the negative impact of nicotine product use on mental health.

FUNDING: Unfunded

POD1-4

INCREASING PREVALENCE OF MENTAL HEALTH PROBLEMS AMONG MENTHOL CIGARETTE SMOKERS- FINDINGS FROM THE NATIONAL SURVEY ON DRUG USE AND HEALTH 2008 TO 2018

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Significance: The market share of menthol cigarettes has risen sharply in the past decade and nascent data suggest that menthol cigarette smoking is more common among smokers with mental health problems (MHP) compared to smokers without MHP. To effectively drive down menthol smoking rates, it is critical to quantify the prevalence of menthol cigarette use and to identify those at highest risk for onset and persistence of menthol use. The goal of the current study is to fill this gap by examining: a) the prevalence of MHP among menthol smokers over time and b) whether the prevalence of MHP among menthol smokers over time differs by demographics. **Methods:** Using the 2008-2018 National Survey on Drug Use and Health, we examined the prevalence of past-month serious psychological distress (>13 on the K6 scale) among adult (≥ 18) menthol smokers (past 30-day), overall and by demographic subgroup, to estimate the proportion of MHP among remaining menthol smokers over time. Weighted crosstabs were used to examine the prevalence of MHP by year, overall and by age, race/ethnicity and sex. Orthogonal polynomials were used to perform logistic regression analyses

**PAPER SESSION 2: IMPACT OF RESTRICTING ACCESS TO TOBACCO PRODUCTS****POD2-1****IMPACT OF TOBACCO 21 POLICIES ON YOUTH SMOKING DISPARITIES, TAKEAWAYS FOR THE NATIONAL POLICY**

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Significance: Little is known about the potential differential impact of Tobacco 21 policies by sociodemographic factors, making the health equity impact of a national Tobacco 21 law unclear. We sought to evaluate the differential impact of Tobacco 21 policies on youth smoking by grade, sex, race/ethnicity, parental educational attainment, and plans to attend college. **Methods:** We conducted a pooled cross-sectional analysis using Monitoring the Future data from 2015-2019 to examine the relationship between county-level Tobacco 21 coverage and past 30-day smoking, first cigarette initiation in the current grade, and daily smoking initiation in current grade. We stratified by grade (8th, 10th, and 12th) and tested for interactions between Tobacco 21 coverage and sex, race/ethnicity, parental education, and plans to attend college. Adjusted Poisson regression models controlled for respondent's living arrangement, high school program type, mother's employment, state-level cigarette taxes, county-level smoke-free coverage, year of survey administration, and sociodemographic characteristics. **Results:** In adjusted regression models, 12th graders in counties with 100% Tobacco 21 coverage (versus counties with no or little Tobacco 21 coverage) had a lower likelihood of past 30-day smoking participation (Prevalence Ratio (PR): 0.72; CI: 0.55-0.95) and daily smoking initiation in the current grade (PR: 0.42; CI: 0.20-0.87), while 10th graders were less likely to initiate first cigarette smoking (PR: 0.70; CI: 0.49-1.00). Interactions showed that Tobacco 21 policies were more effective in reducing smoking participation among 10th and 12th graders with parents of lower versus higher educational attainment, and among Hispanic and Other/Multiracial 12th graders relative to non-Hispanic White 12th graders. **Conclusions:** A national Tobacco 21 policy may reduce the likelihood of smoking, but the effectiveness might differ based on grade, race/ethnicity, and parental educational attainment. Our findings suggest Tobacco 21 laws could help reduce tobacco-related health disparities in the United States.

FUNDING: Federal

POD2-2**TOBACCO 21 POLICIES ARE ASSOCIATED WITH LOWER ODDS OF TOBACCO USE AMONG YOUNGER ADOLESCENTS IN MINNESOTA**

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Significance: Increasing the minimum tobacco purchasing age to 21 (T21 policies) has shown promise in reducing adolescent tobacco use. However, few studies have examined differences in tobacco use across multiple products among adolescents with heterogeneous exposure to T21 policies. *This study* examined whether local T21 policy adoption affected youth tobacco use behaviors in Minnesota. **Methods:** This study used data from the 2016 and 2019 Minnesota Student Surveys and utilized a 2 (T21 policy exposure: yes, no) x 2 (time: 2016, 2019) quasi-experimental design. The analysis assessed whether respondents' attendance at a school within a jurisdiction that had implemented a T21 policy between the 2016 and 2019 surveys correlated with reductions in past 30-day use of cigarettes, cigars, e-cigarettes, hookah, chewing tobacco, flavored tobacco products, and multiple product types. Participants were 8th, 9th, and 11th graders (n=117,973 in 2016 and n=123,289 in 2019). Stratified mixed effects logistic regressions modeled adolescent tobacco use by T21 policy exposure, controlling for baseline tobacco use prevalence at the school-level in 2016 and other demographics. **Results:** T21-exposed students in 2016 were significantly less likely to report past 30-day use of any tobacco (8.5 vs. 12.6%), e-cigarettes (7.8 vs. 10.6%) and other tobacco products (all p<0.005 except for hookah) relative to unexposed students; this remained true in 2019. After adjusting for baseline tobacco use and other demographics, T21-exposed 8th and 9th graders had significantly lower odds of tobacco use in 6 of 8 models, e.g. any tobacco (aOR=0.78, 95% CI: 0.72, 0.85), flavored tobacco (aOR=0.75, CI: 0.66, 0.85), and e-cigarettes (aOR=0.78, CI: 0.72, 0.85). T21-exposed 11th graders had significantly lower odds of any tobacco use (aOR=0.90, CI: 0.82,

and to examine linear trends in MHP. **Results:** The prevalence of MHP among menthol smokers increased from 10.3% in 2008 to 13.9% in 2018 (p<.001). Among young adults (aged 18-34), MHP increased among menthol smokers during this time (12.8% to 18.5%, p<.001), while remaining stagnant among older adults (aged ≥35; 8.3% to 9.9%, p=.073). MHP among NH white (11.8% to 16.5%, p<.001), NH other (7.4% to 10.6%, p=.0298) and Hispanic (7.4% to 10.6%, p=.0177) menthol smokers increased; among NH Black menthol smokers, MHP was stable (8.3% to 9.6%, p=.0919). MHP increased among both male (8.3% to 10.2%, p=.0027) and female (12.2% to 17.5%, p<.001) menthol smokers. **Conclusions:** The proportion of remaining adults who smoke cigarettes in the US with mental health problems has increased over time. As MHP are a barrier to cessation, targeted efforts to integrate mental health screen for and potentially treat MHP alongside tobacco use disorder among those seeking treatment who smoke menthol should be strongly considered.

FUNDING: Federal

POD1-5**MEDIATIONAL PATHWAYS OF TOBACCO USE AMONG ADULT SMOKERS WITH PSYCHIATRIC SYMPTOMS: TESTING LONGITUDINAL MEDIATION USING THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) SURVEY**

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Purpose: Individuals with psychiatric disorders suffer disproportionately from tobacco-related morbidity and mortality. Existing literature suggests a disconnect between respiratory symptomatology associated with smoking and smoking risk perceptions among those with psychiatric disorders. To better understand these discordant relationships, we tested mediational pathways between internalizing psychiatric symptoms and distal changes in smoking. **Methods:** This study uses data from PATH Adult Public Use Files, Waves 1 through 4 (2013-2017, N= 4,152). Psychiatric symptoms were indexed with the internalizing sub-scale of The Global Appraisal of Individual Needs-Short Screener (GAIN-SS). We selected mediators (self-reported respiratory symptoms, cigarette risk perception, and cigarette dependence [CD]) based on extant evidence. Our focal outcome was cigarettes per day (CPD). Structural equation models (SEM) were run across observations from Wave 1-3 and 2-4 to determine the direct and indirect effects relationship between psychiatric symptoms and CPD through each mediator. Models were based on a complete case analysis and restricted to daily smokers. Auto-regressive SEM models were run with bootstrapped standard errors (SE) that accounted for confounders such as CPD and mediator (at model baseline), socioeconomic status, age, sex, race, and Latino ethnicity. **Results:** The relationship between internalizing symptoms and CPD was mediated by CD (indirect: B=0.093, SE=0.045, p=0.038) and respiratory symptom severity (indirect: B= 0.440, SE=0.113, p= 0.000). Internalizing symptoms predicted higher harm perceptions (B=0.135, SE= 0.038, p=.000) but the indirect relationship with CPD was non-significant. Findings from Waves 2-4 replicated these results. **Conclusion:** Our results indicate that CD and respiratory symptoms partially mediate the relationship between internalizing symptoms and CPD but that higher risk perceptions may not be associated with changes in smoking behavior. Treatments that highlight discrepancies between respiratory symptoms, risk perceptions, and smoking behavior may increase motivation to quit among smokers with psychiatric symptoms. **Funding:** Supported by grants from the National Institutes of Health; NIDA pre-doctoral fellowship award (F31DA049460), CENIC (U54DA031659) and the UVM TCORS (U54DA036114). The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA.

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0.99), but had greater odds of cigarette use (aOR=1.23, CI: 1.01, 1.50). **Conclusions:** While the association between T21 exposure and increased cigarette use among 11th graders merits further investigation, our findings indicate that T21 policies may reduce a broad range of tobacco product use, particularly in younger adolescent populations.

FUNDING: Academic Institution

POD2-3

TOBACCO 21 ADOPTION DECREASED SALES OF CIGARETTE BRANDS PURCHASED BY YOUNG PEOPLE

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Introduction: Policies raising the minimum age of sale of tobacco products to 21 (T21) proliferated at state and local levels across the US before a federal policy was adopted. Evidence of the effectiveness of these policies is building and lags implementation. This study exploits demographic patterns of cigarette brand purchasing to evaluate the effectiveness of T21. **Methods:** To capture the effect of T21 implementation on cigarette sales, we used UPC-level data from Nielsen Scantrack data covering January 2015 to October 2019. We used the 2015-2018 National Survey on Drug Use and Health to identify cigarette brands where smokers under 21 comprised a disproportionately high (young) and low (old) share of consumption. We fit fixed-effects linear regressions in Nielsen designated market areas to test if sales of young or old cigarette brands were changed by T21. Unadjusted models controlled for time and T21 implementation date. Adjusted models controlled for price, seasonality, and unemployment. A permutation test of 5000 randomized placebo T21 policies were fit to determine how well the true date of implementation fit sales data stratified by brand group. **Results:** Sales of disproportionately young brands declined after T21 implementation. T21 policy implementation dates fit disproportionately young brand sales trends better than 99% of adjusted randomized placebo models. T21 implementation fit disproportionately old brand sales trends better than just 1% of adjusted randomized placebo models. **Conclusion:** This study adds compelling empirical evidence that T21 decreased purchases of the cigarette brands consumed disproportionately by young people, the policy's target demographic.

FUNDING: Other

POD2-4

RESTRICTED ACCESS TO TOBACCO PRODUCTS AND SMOKING CESSATION THERAPIES INFLUENCES HYPOTHETICAL TOBACCO USE BEHAVIORS AMONG SMOKERS AND E-CIGARETTE USERS: RESULTS FROM AN ONLINE EXPERIMENT

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Introduction: The spread of COVID-19 has prompted regulations restricting consumer access to retail outlets across the US. Such regulations are likely to limit tobacco users' access to tobacco products and smoking cessation therapy (SCT) and consequently, may affect tobacco use behaviors. **Methods:** To predict changes in tobacco use behaviors in response to restricted access to tobacco products and SCT (e.g., medications and nicotine replacement), we conducted an online experiment (Amazon's Mechanical Turk) with n=990 current smokers, e-cigarette (ECIG) users, and dual users from April 27 to June 8, 2020. Participants were randomized to one of four hypothetical conditions: tobacco retail stores open/pharmacies with SCT open (TOPO; n=253), tobacco stores open but favorite brand unavailable/pharmacies open (TOPO-NFB; n=246), tobacco stores closed/pharmacies open (TCPO; n=248), and tobacco stores closed/pharmacies closed (TCPC; n=243). Outcomes included the likelihood of quitting all tobacco use, reducing, switching brands, switching products, or finding other tobacco sources and were evaluated using visual analog scale items (0-100). Linear regressions tested for associations between conditions and changes in expected behavior, controlling for user group (exclusive smoker/exclusive ECIG user/dual user), demographics, flavored product use, weekly spending on tobacco, and intentions to quit. **Results:** Participants in the TCPO condition were more likely to report quitting, reducing, switching brands or products, and finding other tobacco sources (ps<0.001) relative to those in the TOPO condition. Across all four conditions, flavored tobacco product users (menthol cigarettes/flavored e-cigarettes) were more likely to report increasing use and switching brands or products (ps<0.05) and dual users were more likely to maintain their current level of tobacco use and to switch products than exclusive smokers or ECIG users (ps<0.05).

Conclusions: These findings indicate that restricting access to tobacco retailers may influence tobacco use behaviors, but that such approaches may exert less influence on users of flavored tobacco products and dual users.

FUNDING: Federal

POD2-5

AN ESTIMATION OF THE POPULATION HEALTH EFFECTS OF REDUCING NICOTINE IN COMBUSTIBLE CIGARETTES GRADUALLY VS INSTANTANEOUSLY - A SIMULATION ANALYSIS

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Significance In 2017, the Food and Drug Administration (FDA) announced a plan to explore reducing nicotine levels in cigarettes to non-addictive levels. This task involves the evaluation of several implementation timelines for such potential regulatory action. While a published study (Hatsukami et al., *JAMA* 2018) found that immediate nicotine reduction in cigarettes produced a larger decline of biomarkers of smoke exposure compared to a gradual decrease, the implications of these findings at the population level have not yet been studied. The FDA will need to evaluate the differential health effects of these two possible schedules at the population level to select a timetable for the implementation of this potential regulation. **Methods** We used a well-established population-dynamics simulation model of smoking prevalence and health effects to calculate and contrast the cumulative mortality over 2025-2100 stemming from an immediate vs. a gradual (over ten years) nicotine reduction schedule. We parameterized the model with NHIS data and published results of clinical trial studies on nicotine reduction in cigarettes (including the Hatsukami study). We then performed an extensive sensitivity analysis by simulating 45 different scenarios varying the effects of nicotine reduction in the smoking cessation rate (100%, 163%, and 200% increase) and the persistence of those effects (five years, and indefinitely, but losing 50% and 75% of the effect after five years) under five different background initiation rates (13%, 7.8%, 5%, 3%, and 0%). Each of the simulated scenarios consisted of two runs, depicting an immediate and a gradual reduction of nicotine in cigarettes. We then reported the difference in cumulative mortality between the immediate and gradual runs for each scenario. **Results** Our results show that an immediate reduction of nicotine would outperform a gradual decrease by 215,000-904,000 premature deaths averted (PDA), corresponding to 3,910,000-16,614,000 life-years saved (LYS). The median of our results is 564,000 PDA (9,976,000 LYS), and 80% of our result values are above 420,000 PDA (7,568,000 LYS). We also report the total number of LYS (10 - 46 million) under each run for each scenario and compare our figures with the results from a recently published article on nicotine reduction (Apelberg et al., *NEJM* 2018), for validation purposes. **Conclusion** Our findings show that, if the FDA were to implement a regulation to reduce the nicotine levels in cigarettes to non-addictive levels, an immediate implementation of such action would save hundreds of thousands more lives than if the provision were enacted gradually. Our study can inform and provide support for a potential regulatory action to reduce nicotine in cigarettes.

FUNDING: Federal

**PAPER SESSION 3: THE YOUNG MIND:
DRUG EXPOSURE DURING DEVELOPMENT****POD3-1****GESTATIONAL EXPOSURE TO PGVG ALONE COMPROMISES
FETAL GROWTH**

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SIGNIFICANCE Many pregnant women have misperceptions that ECs are a safer than tobacco. Prevalence studies suggest 5-15% of women vape during pregnancy. However, the impact of gestational exposures remains poorly characterized, including impacts of exposure to propylene glycol/vegetable glycerin (PGVG) alone. We sought to determine the impact of gestational PGVG on pregnancy success rates, fetal and postnatal growth as well as cardiopulmonary development. **METHODS** C57Bl/6 mice were bred with daily surveillance for copulation plugs. Females were exposed to aerosolized 50%/50% PGVG from embryonic day 0 (E0 or day of plug) through delivery (E19) in a CH Technologies exposure system. Treatment included 10 x 70 ml puffs of PGVG aerosol delivered every 30 min x 16 cycles to parallel published clinical use. Outcomes were compared with sham-handled controls. Rates of pregnancy, litter size, offspring birthweight (BW) as well as postnatal growth were evaluated. All litters were culled to comparable size with collection of brain from select offspring at postnatal day 0 (P0). Heart tissue was harvested at P14 with micro-dissection for assessment of right ventricular hypertrophy (RVH = weight RV/LV+S) as well as lung inflation with fixation for morphometric analysis. **RESULTS** Comparable pregnancy rates (80% [PGVG] versus 85% [control]) and litter size (8 ± 1 [PGVG] and 8 ± 0.8 [control]) were observed. While a trend towards lower BW was noted with PG/VG, this difference was not significant ($1.22g \pm 0.07$ [PGVG] versus $1.29g \pm 0.13$ [control]). Gestational exposure to PGVG also resulted in compromised postnatal growth with 8.2% growth failure by P14 (Fig 2). RVH was also present at P14 in PGVG offspring (0.37 ± 0.09 [PGVG] versus 0.29 ± 0.05 [control]). Morphometric analysis of lung tissue is pending. **CONCLUSION** In a model paralleling clinical use of ECs, gestational exposure to PGVG alone resulted in postnatal growth failure and RVH. These data advocate for further evaluation of gestational exposure to common constituents present in ECs.

FUNDING: Unfunded

POD3-2**THIRDHAND SMOKE EXPOSURE IS ASSOCIATED WITH
BACTERIAL VARIATIONS AND DECREASED DIVERSITY IN THE
GUT MICROBIOME DURING INFANCY**

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Significance: The impact of thirdhand smoke (THS; i.e., post-combustion tobacco residue) on the gut microbiome is underexplored, particularly in hospitalized infants while the microbiome is developing rapidly. Microbiome differences have been found in adults who smoke or use nicotine compared to non-using adults. Our aim was to explore gut microbiome differences for infants in a neonatal ICU (NICU) based on their exposure to THS. **Methods:** Forty-three mother-infant dyads from a metropolitan NICU consented to an interview, carbon monoxide (CO)-breath sample, bedside furniture-nicotine wipes (n=43), an infant-urine sample (n=42; for cotinine analyses), stool collection (n=40; for 16Sv4 gene sequencing), and breastmilk collection (n=20). Participants from homes with one or more individuals who smoke ("cigarette-using homes"; n=32) were over-recruited by design, compared to participants from homes with no individuals who smoke ("non-cigarette homes"; n=11). Two alpha-diversity indices (OTU, Shannon) were modeled as lognormal and skew-normal processes. Negative binomial regression modeled 8 gut microbiome bacteria, selected from recent microbiome studies examining relationships with nicotine/tobacco. All outcomes were modeled as functions of three predictors of THS exposure: cigarette-using-home status, infant urine cotinine, and bedside-furniture surface nicotine, and included four covariates associated with microbiome colonization (i.e., gestational age, postnatal age at sample collection, antibiotic use, and receipt of breastmilk). Bayesian posterior probabilities (PP) $\geq 75.0\%$ that regression coefficients were either negative ($b < 0$) or positive ($b > 0$) were considered

meaningful evidence. **Results:** Cigarette-using homes and higher surface nicotine were related to lower levels of both alpha-diversity indices. Most bacteria (7 out of 8) demonstrated a meaningful association for at least one of the primary THS-exposure predictors (home type, cotinine, and/or nicotine). For example, the health-promoting gut bacteria *Bifidobacterium* regression demonstrated lower incidence rate ratios (IRR) for cigarette-using homes (IRR<0.01 [<0.01 , 7.38]), greater urine cotinine (IRR=0.08 [<0.01 , 2.84]), and greater (furniture) nicotine (IRR=0.01 [<0.01 , 64.02]). **Conclusions:** THS exposure was associated with differences in the gut microbiome. These data highlight a need for greater THS-related research and protections for NICU infants during critical stages of human development.

FUNDING: Federal

POD3-3**EFFECTS OF CHERRY FLAVORANT ON ORAL NICOTINE TASTE,
WITHDRAWAL, AND REINSTATEMENT IN ADOLESCENT RATS**

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Significance: We previously reported that benzaldehyde, a cherry flavorant, increased hedonic and decreased aversive taste responses to oral nicotine in adult rats. Since the effects of benzaldehyde in adolescents remain unclear, we aimed to determine the effects of benzaldehyde on oral nicotine's taste in adolescent rats. We also investigated whether benzaldehyde affects chronic nicotine use by altering tolerance to nicotine's aversive taste, withdrawal, and reinstatement effects. **Methods:** We used a combined model including taste reactivity and two-bottle choice tests. Adolescent Sprague Dawley rats (n = 6-8/sex/group) were implanted with intraoral catheters. Rats were first tested for their taste responses to water, benzaldehyde (100 μ g/ml), nicotine (10 μ g/ml), or benzaldehyde + nicotine combination. Rats received 20 infusions (125 μ l/ea) of test solution over 45 min. Then, they were given two bottles, one containing water, the other containing test solution through two-bottle choice test. After two weeks of exposure, rats were tested again for their taste responses to the test solutions. Next, the animals were given water only for a day, and were tested for withdrawal symptoms. The following day, the rats were given back to their test solutions. **Results:** Benzaldehyde did not alter the taste responses of nicotine in females, but it slightly increased the hedonic response in males. The aversive responses to nicotine in naive animals vanished after chronic nicotine exposure, indicating the development of tolerance to nicotine's aversive taste in both sexes. Chronic nicotine use induced withdrawal. When animals were given back the water and nicotine solution, they reinstated nicotine use. They showed higher preference to nicotine compared the values before nicotine withdrawal. The group which received benzaldehyde + nicotine combination, showed similar results with nicotine group in taste reactivity, withdrawal, and reinstatement experiments. **Conclusion:** Benzaldehyde did not alter the orosensory experience of nicotine in adolescent rats which is different from our previous results obtained from adult rats. Age differences may contribute to benzaldehyde's effects.

FUNDING: Federal

POD3-4**ADOLESCENT NICOTINE AND CANNABINOID EXPOSURE
ALTERS SUSCEPTIBILITY TO CUE-INDUCED NICOTINE RELAPSE
LATER IN LIFE**

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Significance: Recent studies suggest that adolescent exposure to substances of abuse, including nicotine or cannabis, may alter neuromaturation and neurocognitive function during adulthood. Nicotine, the main psychoactive component in cigarettes and e-cigarettes, acts on neuronal nicotinic acetylcholine receptors in the brain. The main psychoactive component in cannabis, THC, acts on cannabinoid receptors. Here, we examined the effects of adolescent exposure to nicotine, a cannabinoid receptor agonist (WIN55-212,2), or co-exposure to both substances on nicotine relapse-related behaviors in adult male and female mice. **Methods:** During adolescence, mice were injected with vehicle, nicotine, WIN55-212,2, or both substances across 12 consecutive days. During adulthood, mice were trained in a food self-administration paradigm. Subsequently, catheters were intravenously implanted in the jugular vein, and following a recovery period, the mice were given access to self-administer nicotine. After establishing stable responding with intravenous nicotine self-administration, mice were tested in the incubation of craving protocol to assess nicotine relapse-related behavior. This was measured via lever pressing behavior in the absence of nicotine, on day 1 and day 24



post-nicotine. Data was analyzed using repeated-measures one-way ANOVA with Prism 7 software. Significant effects were followed by Tukey's post-hoc multiple comparisons test. The criterion for significance was set at $\alpha = 0.05$. **Results:** Our findings reveal differential effects in relapse-related behavior within each sex, dependent on adolescent drug exposure. Control male and female mice displayed a significant increase in nicotine seeking behavior after the incubation period. Males exposed to WIN55-212,2 alone, or co-exposed to nicotine/WIN55-212,2, and females exposed to WIN55-212,2 alone also exhibited an incubation effect with increased lever pressing behavior. Conversely, males exposed to nicotine and females exposed to nicotine alone, or nicotine/WIN55-212,2, did not exhibit a significant change in nicotine seeking following the incubation period. **Conclusion:** Together, these data provide evidence that adolescent exposure to nicotine and/or cannabinoids alters later nicotine relapse-related behaviors in a sex-dependent manner during adulthood. This research was supported by the Tobacco and Related Disease Research Program award 26IP-0043 to CDF and the National Science Foundation Graduate Research Fellowship award DGE-1839285 to AJE.

FUNDING: Federal; State

POD3-5

HEIGHTENED STRIATAL AND PREFRONTAL ACTIVATION DURING SOCIAL REWARD PROCESSING AMONG YOUNG ADULT SMOKERS COMPARED WITH NON-SMOKERS IMPLICATIONS FOR UNDERSTANDING RISK

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Significance: Social relationships are critical to young adult development, and social deficits may be a risk factor for use of substances, including nicotine. Social rewards (e.g., being liked) engage key reward-related brain circuitry implicated in the pathophysiology of smoking. As such, social functioning may impact, or be impacted by, tobacco use, via shared neural pathways. **Methods:** We examined brain activation in young adult (18-29) overnight-abstinent daily smokers (n=21) and nonsmokers (n=22) in response to a validated fMRI social "likeability" task. Participants were first presented with photos of fictitious peers and asked to rate how much they thought they would like each individual; they were informed that their own photo would also be rated. During the scan, participants received "feedback" in each of three categories: 1) being rated highly by those whom they also rated highly (mutual liking), 2) being rated highly by those they had rated lower (received liking), or 3) no feedback available (neutral). Smokers/nonsmoker differences in response to mutual > received liking and all positive > neutral feedback were evaluated within *a priori* regions of interest (ROIs) in the bilateral ventral striatum (VS) and medial prefrontal cortex (mPFC), with cluster significance of $P < .05$. **Results:** Smokers exhibited greater activation than nonsmokers to mutual > received liking across ROIs. There were no differences for all positive > neutral feedback. Smokers reported greater anhedonia ($p < .05$) and lower subjective social status ($p < .05$) than non-smokers. Anhedonia was positively correlated with mutual > received liking in the right ($r = .34, p < .05$) and left ($r = .37, p < .05$) VS and mPFC ($r = .32, p < .05$). **Conclusion:** These results contrast with prior monetary reward studies indicating blunted striatal activation among smokers, but replicate work demonstrating greater mPFC activation associated with social anhedonia in young adults. Heightened VS and mPFC activation among smokers may indicate greater salience of positive social feedback, potentially against a backdrop of diminished positive social experiences, or a heightened ruminative process during self-reflection. Future work should determine if differences in neural processing of social rewards are due to smoking withdrawal, or are a risk factor or consequence of repeated nicotine use.

FUNDING: Federal; Nonprofit grant funding entity

**PODIUM PRESENTATION 2****PAPER SESSION 4: BEYOND DESCRIPTION: INFORMING AND CORRECTING DISPARITIES IN CESSATION****POD4-1****GROUP COGNITIVE BEHAVIORAL THERAPY AMONG RACIALLY/ETHNICALLY DIVERSE SMOKERS - IMPLICATIONS FOR DISPARITY ELIMINATION**

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Significance: Racial/ethnic minorities are less likely to achieve long-term smoking abstinence compared to Whites. Intensive behavioral treatment that focuses on stress and coping has shown promise among racial minority smokers, and it is important to understand whether such interventions can eliminate cessation disparities. This dual-site RCT tested the effects of group-based cognitive behavioral therapy (CBT) on long-term abstinence with the goal of addressing this question. We hypothesized that compared to general health education (GHE), CBT would produce greater overall abstinence at the time of assessment (i.e., point prevalence abstinence; ppa), with no racial/ethnic differences. Methods: Treatment-seeking adult smokers [N=347; White (32%), African American/Black (39%), or Hispanic (29%)] were recruited in Tampa and Miami, FL, and randomly assigned to CBT (n=161) or GHE (n=185). The sample was middle aged, mostly female, with low income, and completed at least high school. Both interventions included 8 group sessions plus 8 weeks of nicotine patch therapy. Biochemically verified ppa was assessed at the end-of-treatment (EOT), and 3-, 6-, and 12-months later. Generalized linear mixed modeling, controlling for covariates, tested the longitudinal effect of intervention condition across the 12-months of follow-up, and logistic regressions tested intervention condition (CBT vs GHE) by race/ethnicity interactions. Adjusted odds ratios (aOR) and 95% confidence intervals (95%CI) were calculated. Results: At the EOT, overall intent-to-treat ppa was 42%, followed by 35%, 32%, and 26%, at the 3-, 6-, and 12-month assessments, respectively. After adjusting for study site, education, and income, there was a significant, effect of intervention condition, such that CBT led to greater smoking abstinence across the 12-month follow-up period (aOR=1.50, 95%CI: 1.04-2.24, p=.03) compared with GHE. Neither the effect of race/ethnicity nor the intervention condition by race/ethnicity interactions were significant. Conclusion: CBT led to greater smoking abstinence compared to GHE in a diverse sample. Unlike previous studies, there were no racial/ethnic disparities in cessation rates in either intervention. Findings suggest that group CBT has the potential to move the needle on cessation disparities.

FUNDING: State; Academic Institution

POD4-2**DUAL USE OF CIGARETTES AND E-CIGARETTES IN AFRICAN AMERICAN AND LATINX SMOKERS: SECONDARY ANALYSES FROM A RANDOMIZED CONTROLLED E-CIGARETTE SWITCHING TRIAL**

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SIGNIFICANCE: Little is known about the harm reduction potential of dual cigarette-e-cigarette (CC-EC) use among racial and ethnic minorities who bear a disproportionate tobacco-related health burden and are more likely to engage in dual CC-EC use. This is the first known study to evaluate dual use patterns and related biomarkers of exposure (BOE) and potential harm (BOPH) among African American (AA) and Latinx CC smokers enrolled in an EC switching randomized clinical trial. **METHODS:** 114 CC smokers (52% AA; 48% Latinx) were randomized to the EC group, provided with JUUL ECs, and asked to switch exclusively for 6 weeks. The present study is a secondary analysis of the 64 (56%; 35 AA and 29 Latinx) who were dual CC-EC users at the end

of the 6-week intervention period. Dual use patterns were examined by assessing substitution from CCs to ECs at week 6. Change in BOE (e.g., cotinine, NNAL, CO) and BOPH (e.g., self-reported respiratory symptoms) from baseline (BL) to week 6 were compared using two-sided t-tests. Pearson correlation was used to examine the association between CC to EC substitution and reduction in NNAL at week 6. **RESULTS:** On average, dual users substituted 79% of their CCs for ECs at week 6. This corresponded to a significant reduction in CCs from BL to week 6 (-70.0 ± 54.1 CC per week, p<.001). Total nicotine consumption remained stable (BL: 1160.5 ± 1042.1 pg/mL of cotinine, W6: 1312.5 ± 1725.9 pg/mL of cotinine, p=.47), while significant reductions were seen in NNAL (-55.9 ± 88.6 ng/ml, p<0.001), CO (-6.3 ± 8.6 ppm, p<0.001), and respiratory symptoms (-3.3 ± 8.0, p=0.002). Greater substitution from CCs to ECs was associated with larger reductions in NNAL (r = -.29, p=.02). **CONCLUSIONS:** Findings demonstrate the short-term harm reduction potential of dual CC-EC use in AA and Latinx smokers and suggest that the greatest benefit is achieved by those with higher substitution from CCs to ECs. Future studies are needed to confirm these findings in a larger sample with longer follow-up and in dual users with differing rates of substitution from CCs to ECs.

FUNDING: Federal

POD4-3**REDUCING SMOKING CESSATION DISPARITIES ACROSS THE LIFESPAN: FEASIBILITY OF A TECHNOLOGY-BASED APPROACH AMONG MEDICAID RECIPIENTS**

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Tobacco-related health disparities exist among U.S. adults receiving public health insurance (Medicaid), as they are nearly twice as likely to be current smokers, while facing significant treatment access barriers. Medicaid beneficiaries express a strong desire to quit and technology-based interventions may help reduce disparities in disease burden. Analyses also suggest a savings of nearly \$2.5 billion with a 1% reduction in smoking prevalence in this population. As such, we examined interest in technology-based cessation services among individuals on Medicaid. We conducted phone interviews with 100 adult primary care patients who were current tobacco users and were receiving Medicaid insurance about their use of tobacco products, openness to technology-based interventions, and readiness to change smoking behavior. Individuals (mean age: 37.73, range: 19-53) primarily used combustible cigarettes (92%) and most had their first cigarette within 30 minutes of waking (61%). Cessation formats which interested participants most were contingency management (74%), nicotine patches/gum (56%), one-on-one counseling (57%), text messaging (52%), and using a computer/internet-based program (54%). All but 2 participants owned a cell phone and all but 7 had smartphones. When asked more specifically about an iPad-based screening and intervention to be conducted in the waiting room during their next primary care visit, 95% were willing to complete the screening, 90% were willing to complete a 10-min intervention, and 91% were open to talking with providers about the results. Moreover, 78% were interested in receiving ongoing text messages for one month; on average, they were willing to receive these messages for 6 months. Age and gender were not related to readiness to quit, technology access, or openness to utilizing technology for cessation. Participants were unanimously open to using technology for cessation services. Moreover, it is noteworthy that interest in technology-based approaches persisted across age and that this population owns the devices necessary to engage with this approach. Results suggest that implementation of a technology-based smoking cessation intervention integrated within primary care may have broad applicability among Medicaid beneficiaries and high likelihood of reducing disparities in tobacco-related disease burden.

FUNDING: Unfunded



POD4-4

“HEALING WITHIN” THE DEVELOPMENT OF SMOKING CESSATION INTERVENTION FOR AMERICAN INDIAN WOMEN EXPERIENCING INTIMATE PARTNER VIOLENCE

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Background: American Indian women who have experienced intimate partner violence (IPV) smoke at a higher rate than women who have not experienced IPV. According to our recent study, Northern Plains Tribal women smokers suffer from higher rates of post-traumatic trauma, anxiety, and depression than Northern Plains Tribal women smokers who've not experienced IPV. Yet, to date, there have been no smoking cessation interventions developed specifically for this understudied population. **Objectives:** The NIH-funded “Healing Within: Smoking Cessation for American Indian Women” aims to develop a cessation program that is grounded in Lakota cultural values and trauma-informed strategies for urban Northern Plains Tribal women smokers who have experienced IPV. **Methods:** The research team conducted a series of key informant interviews with service providers (N=13) and focus group discussions with former and current smokers Northern Plains women who experienced IPV (N=44). Through a process of collaborative analysis, we analyzed and interpreted responses to inform the intervention development. **Results:** Relevant themes that were incorporated into the development of our 8-week smoking cessation intervention included: 1) use of Lakota cultural values, teachings and mind-body strategies; 2) intergenerational storytelling to overcome trauma; 3) mentorship and social support; and 4) history of the use of commercial tobacco in Lakota communities. **Conclusions:** Grounding the intervention in Lakota culture and processing different forms of trauma through a Lakota perspective may help Northern Plains Tribal women who have experienced IPV safely understand their trauma and subsequently understand their addiction, guiding them to smoking cessation

FUNDING: Federal

POD4-5

USING SYSTEMS SCIENCE TO ADVANCE HEALTH EQUITY IN TOBACCO CONTROL - A CAUSAL LOOP DIAGRAM OF SMOKING AMONG RACIAL/ETHNIC MINORITY AND LOWER SOCIOECONOMIC GROUPS

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Significance: Tobacco control (TC) interventions that reduce racial/ethnic and socioeconomic disparities in smoking are needed to further reduce overall smoking prevalence rates in the United States (US). Systems science tools can be used to anticipate the intended and unintended effects of TC policies focused on advancing health equity. **Methods:** We developed a causal loop diagram (CLD) to elucidate connections between individual, environmental, and structural causes of racial/ethnic and socioeconomic disparities in smoking. The CLD was informed by a review of conceptual models of smoking, fundamental cause and social stress theories, and 12 qualitative interviews with TC stakeholders. The CLD was then used to examine the potential impacts of 3 policies (smoke-free air (SFA) policy, menthol cigarette ban, minimum price law). **Results:** The CLD includes 23 constructs encompassing individual (e.g. risk perceptions), environmental (e.g. marketing), and structural (e.g. systemic racism) factors associated with smoking. Evaluations of TC policies using the CLD identified potential unintended consequences that may maintain smoking disparities. For example, the intent of the SFA policy for public housing is to reduce smoking among residents. Our CLD suggests that the policy may reduce smoking among residents by reducing smoking among family/friends, which subsequently reduces pro-smoking norms and perceptions of tobacco use as low risk. These processes are reinforcing, resulting in further reductions in smoking among family/friends and more smoke-free homes. On the other hand, some residents who smoke may violate the policy. Policy violations may result in financial strain and/or housing instability, which increases stress and simultaneously reduces feelings of control, thus having the unintended consequence of increasing smoking. **Conclusions:** Policies intended to reduce smoking may have unintended consequences that maintain smoking among priority populations. The CLD may be used to support stakeholder engagement in action planning and to identify additional supports needed to make policies more effective, such as cessation services for residents of public housing.

FUNDING: Federal

PAPER SESSION 5: PRODUCT DESIGN AND PACKAGING: PERCEPTIONS AND BEHAVIOR

POD5-1

LONGITUDINAL EFFECTS OF CIGARETTE PICTORIAL WARNING LABELS AMONG YOUNG ADULTS

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Significance: Young adults are vulnerable to cigarette packaging marketing. Pictorial warning labels communicating the risks of smoking on cigarette packs through text and visual imagery are recommended as a tobacco control intervention. Some evidence demonstrates pictorial warnings impact negative emotion, risk perceptions, and motivation to quit smoking. There is limited data to suggest that these outcomes are sustained over time. **Methods:** The current study analyzes data from a prospective randomized trial of exposure to cigarette pictorial warning labels among young adult smokers ages 18-30 with four time points (N=229). A primary aim of the study was to assess any initial change after a 4 week exposure period to a pictorial warning on fear, anger, risk perceptions, and motivation to quit smoking using latent change score modeling. A secondary aim was to review the longitudinal effects over time on the same outcomes using latent growth modeling over 3 months after the intervention period. **Results:** Latent change score results indicate that pictorial warning exposure was associated with increases in fear (B = 1.05, 95% CI = 0.50, 1.55), anger (B = 0.55, 95% CI = 0.02, 1.07), and motivation to quit (B = 0.28, 95% CI = 0.05, 0.51) between baseline and 4 weeks. Latent growth modeling showed initial evidence that pictorial warning exposure was associated with a positive slope over 3 months for motivation to quit smoking (B = 0.08, 95% CI = 0.01, 0.16), but not other outcomes. **Conclusions:** Results indicate that negative emotions and motivation to quit increased after a 4 week exposure period. Trajectories over 3 months indicate young adults may be particularly sensitive to the effects of heuristic cues used in pictorial warnings to motivate cessation. Latent modeling techniques should be leveraged to subsequently determine what mediates the changes in motivation to quit.

FUNDING: Federal

POD5-2

THE “ORGANIC” CIGARETTE DESCRIPTOR AND ITS ASSOCIATION WITH HEALTH RISK EXPECTANCIES, SUBJECTIVE EFFECTS, AND SMOKING TOPOGRAPHY: A PILOT STUDY

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INTRODUCTION: This mixed method pilot study examined whether the “organic” descriptor affects cigarette smokers’: 1) expectancies (e.g., perceived harm); 2) subjective responses to smoking (e.g., taste); and 3) behavior (e.g., topography). A secondary goal was to describe how smokers interpret the “organic” descriptor and relate it to the subjective experience of smoking an “organic” cigarette. **METHODS:** Twenty-two daily smokers completed a within-person laboratory study advertised to participants as market research for a new tobacco company. Smokers (overnight abstinent) attended 2 experimental sessions and smoked a cigarette (identical Nat Sherman “mellow” cigarettes) paired with either an “organic” or “conventional” descriptor condition and completed subjective and behavioral measures. Participants completed a semi-structured interview at the last visit. **RESULTS:** On average, participants (46% men, 82% non-Hispanic White) were 47.3 years old (SD = 12.7) and smoked 14.5 CPD (SD = 5.1). Despite both cigarettes being identical, participants rated the “organic” (vs. conventional) cigarette as having fewer chemicals (OR 2.6, p<0.0001), being healthier (OR 2.2, p=0.001), making smoking safer (OR 1.7, p=0.014), and having a more favorable burn rate (p=0.006). Other marginal subjective effects results will be discussed. Overall, there were no statistically significant differences in total inhalation volume by condition (p=0.42). Stratifying by gender, men inhaled 225 ml (SE = 56.9) more in the conventional condition; women inhaled 408 ml (SE = 161.3) more in the organic condition (p<0.001). A common understanding of “organic” was that the product was “...less processed... like less chemicals and it's more natural” than a conventional product. Some believed that “organic” cigarettes contained fewer



chemicals, which in turn produced a “much cleaner and healthier smoking cigarette” and that they could “taste the difference.” **CONCLUSIONS:** Exposure to the “organic” descriptor affected smokers’ expectancies and subjective effects; topography results were in opposite directions by gender. Implications for subjective effects measures and gender differences will be discussed.

FUNDING: Federal

POD5-3

FLAVOR CAPSULES AND COLORS ON CIGARETTE PACKS APPEAL TO YOUTH IN MEXICO AND CONTRIBUTE TO MISPERCEPTIONS OF HARM

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SIGNIFICANCE: Flavored cigarettes mask the harshness of smoke and are associated with initiation. Flavor capsule cigarettes are popular in Mexico. We explored the effects of cigarette pack design features commonly used to market flavored cigarettes on Mexican adolescent and adult perceptions of attractiveness and harm. **METHODS:** Adult (18-34 years) smokers and adolescent (13-17 years) smokers and non-smokers (N=2,450) participated in an experimental survey in Mexico City in early 2020. Participants were randomly assigned to one of three flavor conditions (Tropical Burst, Hazel Rush, Arctic Air), viewed images of eight cigarette packs that varied by three design features (flavor name, background color, and flavor capsule imagery), and rated how much they liked the pack and perceived harm. Data were analyzed using mixed effects logistic regressions. **RESULTS:** Packs with a background color were at significantly greater odds of being liked than a grey pack by adults (OR=4.84, 95% CI 3.98-5.87) and adolescents (OR=15.04, 95% CI 12.08-18.71). Packs with a flavor capsule image were at significantly greater odds of being liked compared to packs without by adults (OR=1.85, 95% CI 1.52-2.24) and adolescents (OR=1.83, 95% CI 1.47-2.27). Packs named ‘Tropical Burst’ and ‘Arctic Air’ were at significantly greater odds of being liked by adolescents (OR=1.61, 95% CI 1.18-2.19 and OR=1.79, 95% CI 1.25-2.56) than packs with no flavor name. Packs with a background color (OR=0.76, 95% CI 0.62-0.92) compared to a grey pack, packs with a flavor capsule image (OR=0.75, 95% CI 0.62-0.92) compared to packs with no image, and packs named ‘Tropical Burst’ (OR=0.67, 95% CI 0.50-0.91) compared to packs with no name were at significantly lower odds of being perceived as harmful by adolescents. **CONCLUSION:** Color and flavor capsule imagery on cigarette packs appeal to adults and adolescents. These features also contribute to misperceptions of harm among adolescents. Our findings demonstrate the impact of packaging design on consumer perceptions and highlight the need for plain packaging and flavor restrictions in Mexico.

FUNDING: Nonprofit grant funding entity

POD5-4

NOVEL NICOTINE CONCENTRATION LABELS IMPROVE UNDERSTANDING OF NICOTINE STRENGTH AMONG ADOLESCENT AND YOUNG ADULT E-CIGARETTE USERS

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Significance. E-liquid nicotine concentrations typically are labeled as mg/ml or percent nicotine, which may poorly convey nicotine strength to users. In this study, we developed novel nicotine concentration labels and evaluated whether the new labels better convey information about nicotine strength and related harm. **Methods.** 826 adolescent and young adult vapers completed an online survey (52.7% female, 45% high school age, 64.5% non-Hispanic White, 57% weekly vapers, 18.87[2.73] years old). Participants rated nicotine concentrations (equivalent to 3, 6, 18, 30, 40, and 50mg/ml) from “no nicotine” to “very high nicotine” labeled as mg/ml, percent nicotine, and via four new labels: text-based, caution sign-shaped, and thermometer inspired (horizontally and vertically orientated). Participants also rank ordered labels in terms of perceived ability to convey information about strength, addiction potential, and overall harm. **Results.** Participants most often ranked the thermometer labels in 1st or 2nd place (vertical 77%; horizontal = 70%) and the extant labels in last or second to last place (mg/ml = 59.1%; percent = 47.2%). All new labels outperformed traditional labels in conveying nicotine strength accurately (mean[SD] correct out of 6: percent nicotine = 1.50[1.08]; mg/ml

= 2.14[1.52]; safety = 5.23[1.37], text = 5.33[1.36]; vertical thermometer = 5.28[1.51], horizontal thermometer = 5.47[1.14]). Underestimates of nicotine strength, which raise concerns about inadvertent exposure to high nicotine levels, were high for percent nicotine (63.5%) and mg/ml (36.8%) but low among all new labels (range 4.8-6.8%). When jointly considering perceived ability to communicate nicotine strength, accuracy of strength ratings, and low rates of underestimating nicotine strength, the horizontal thermometer label performed best (ranked 1 or 2 = 70%, percent of nicotine strengths identified correctly = 91.2%). **Conclusions.** All new labels outperformed mg/ml and percent nicotine, but the horizontal thermometer performed best. Findings suggest adopting a novel labeling approach could improve e-cigarette users ability to understand nicotine-related risk associated with vaping.

FUNDING: Federal



PAPER SESSION 6: NEUROBIOLOGICAL UNDERPINNINGS OF NICOTINE DEPENDENCE

POD6-1

ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) FLAVORANTS ACT AS NON-COMPETITIVE ANTAGONISTS OF NACHRS AND CONTRIBUTE TO REINFORCEMENT-RELATED BEHAVIOR

Skylar Y. Cooper, Brandon J. Henderson. Marshall University, Huntington, WV, USA.

Significance An estimated 12 million Americans use ENDS, with ~5 million users between the ages of 12 and 18. Adolescent ENDS use continues to rise likely due to the 15,000+ unique flavor options available as opposed to the lone flavor in combustible cigarettes (menthol). Given the dramatic rise in vaping, it is critical we determine the pharmacology of ENDS flavorants on nAChRs in the addiction-related circuitry of the brain. **Methods** Using kinetic Ca^{2+} influx assays and cultured neuroblastoma-2a cells transiently transfected to contain alpha3beta4, alpha4beta2, and alpha6beta2beta3 nAChRs, we examined the pharmacology of ENDS flavorants on nAChR function. Flavorants with strong non-competitive antagonist (NCA) activity were studied for their potential role in nAChR upregulation using confocal microscopy. Lastly, we utilized vapor self-administration assays with male and female mice to study how these NCA flavorants alter reinforcement-related behaviors. To determine significance we used one- and two-way ANOVAs with post-hoc Tukey analyses. **Results** Menthol and two green apple flavorants (farnesol and farnesene) exhibited strong NCA activity towards alpha4beta2 nAChRs (IC_{50} values of 50-100 μ M). Further, both menthol and farnesol induced nAChR upregulation, whereas farnesene uniquely induced a stoichiometric shift towards high-sensitivity nAChRs. In self-administration assays, we observed that male mice escalated with menthol + nicotine, green apple + nicotine, or green apple alone, and both green apple and menthol enhanced nicotine reinforcement-related behavior. However, only green apple flavorants contributed to reinforcement-related behavior in the absence of nicotine. **Conclusions** We have identified several ENDS flavorants labeled as “generally regarded as safe” to act as NCAs of nAChRs and exert an impact on reinforcement-related behavior in a mouse model of vaping-related behavior. Given the constant rise in flavored ENDS use, further studies on flavors, ENDS devices, and the underlying mechanisms that take place while using these products is necessary to contribute in the regulation of ENDS use and the addiction field.

FUNDING: Federal; E-cigarette/Alternative nicotine products Industry; Academic Institution; Nonprofit grant funding entity

POD6-2

UPREGULATION OF NACHRS AND CHANGES IN EXCITABILITY ON VTA DOPAMINE AND GABA NEURONS CORRELATES TO CHANGES IN NICOTINE-REWARD RELATED BEHAVIOR

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Significance This study reveals novel aspects of nicotinic acetylcholine receptor upregulation in the ventral tegmental area (VTA) and how it is linked to nicotine reward-related behavior. Nicotine is well-characterized to upregulate these receptors, but our work here highlights the role that $\alpha 4^*$ and $\alpha 4\alpha 6^*$ nAChRs play in the short term, intermittent exposure to nicotine that is consistent with early exposure to tobacco and vaping products. **Methods** We used a conditioned place preference (CPP) assay with adult (3-5 month old) male and female $\alpha 4$ -mCherry $\alpha 6$ GFP mice (C57BL/6J background) to examine nicotine reward-related behavior. Mice used in CPP assays were then utilized in either confocal or electrophysiology assays to examine changes in nAChR upregulation or neuronal excitability. In confocal assays we examine the ventral tegmental area (VTA), substantia nigra pars reticulata (SNr), and dentate gyrus. **Results** We observed that concentrations of nicotine sufficient to evoke reward-related behavior robustly upregulate $\alpha 4^*$ and $\alpha 4\alpha 6^*$ nAChRs on midbrain dopamine (DA) and γ -aminobutyric acid (GABA) neurons. Furthermore, the extent of $\alpha 4\alpha 6^*$ nAChR upregulation on ventral tegmental area (VTA) DA neurons aligns with the magnitude of nicotine reward-related behavior. $\alpha 4^*$ nAChR upregulation on VTA DA and GABA neurons also aligned with nicotine reward-related behavior (but not $\alpha 4^*$ upregulation on neurons in the SNr or dentate gyrus). We also show that the upregulation of nAChRs is accompanied by a functional change in firing frequency of both DA and GABA neurons in the VTA that is directly linked to nicotine reward-related behavior. **Conclusions** This work highlights

critical aspects of the VTA in early stages of nicotine exposure. This also highlights the need to expand these studies to exposure paradigms that match long-term exposure to nicotine to highlight region-specific changes that may occur between reward-related and reinforcement-related behaviors.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD6-3

ADOLESCENT NICOTINE AND FOOTSHOCK EXPOSURE AUGMENTS ADULT NICOTINE SELF-ADMINISTRATION WITHOUT AFFECTING BASELINE ANXIETY-LIKE BEHAVIOUR OR STRESS RESPONSIVITY

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Rationale: Adolescent cigarette smoking has steadily decreased over the past decade. However, there has been an increase in adolescent nicotine consumption via the use of vaporizers. Adolescence is a critical period for nicotine initiation and earlier onset use is associated with increased risk of dependence. As perceived stress is a predictor for nicotine use, and stress reduction is a commonly reported reason for using nicotine, a bidirectional relationship between stress and nicotine exists and may have an impact into adulthood even after that exposure has stopped. **Objectives:** Determine the prolonged impact of high-dose nicotine and footshock exposure in adolescence on adult behaviour and hormonal responsivity in adulthood. **Methods:** During adolescence (post-natal day [P]28-56) male Sprague-Dawley rats were exposed to either saline (SALPRE: 1ml/kg, SC, every day), nicotine (NICPRE: 1mg/kg, SC, every other day; 14 total injections), footshock (SHOCKPRE: 8 presentations; 0.08mA; 0.5sec duration, every other day), or the combination of nicotine and footshock (NIC+SHOCK: co-occurring, or NIC—SHOCK: alternating). At P70, one subset was implanted with jugular catheters and allowed to self-administer 0.03 mg/kg/infusion nicotine; another subset was assessed on open-field behaviour in a drug-free state (P71) and corticosterone response to nicotine or shock in adulthood (P72-73). **Results:** Intermittent adolescent nicotine or footshock alone (NICPRE and SHOCKPRE) did not potentiate adult nicotine intake compared to SALPRE. However, NIC+SHOCK and NIC—SHOCK increased adult nicotine consumption without any associated differences in baseline anxiety-like behaviour or stress responsivity in adulthood. NIC—SHOCK also displayed increased drug seeking when nicotine became unavailable, and increased non-reinforced lever pressing during acquisition and extinction. **Conclusions:** Adolescent nicotine and footshock stressors have a synergistic effect on adult nicotine consumption, enhancing nicotine intake. Stress reduction in adolescent nicotine users may reduce vulnerability to adult nicotine consumption and relapse.

FUNDING: Federal; Academic Institution

POD6-4

ROLE OF ANTERIOR INSULA IN CONTEXT-INDUCED RELAPSE OF PUNISHED NICOTINE SEEKING

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Significance. In humans, cues and environments associated with nicotine use cause relapse during abstinence. The neural substrates of context-induced nicotine seeking are poorly understood. Previous animal models of nicotine relapse used extinction to suppress nicotine seeking. However, the motivation for abstinence in humans is not adequately modelled by operant extinction. Rather, people typically abstain because of the increasing negative consequences of nicotine use. Here I will present data showing the development of a model of nicotine relapse after punishment-imposed abstinence, and will present recent studies aimed to identify the brain mechanisms of this form of relapse. **Methods.** We train rats to self-administer intravenous nicotine in one context (NIC), and subsequently punish nicotine self-administration with response-contingent footshock in another context (PUN). After complete suppression of nicotine use by punishment, nicotine seeking is tested in extinction conditions without nicotine or punishment. To identify candidate neural regions critical for this relapse, we used fos expression as a marker of neuronal activity associated with the final test. In another group of rats, we also used in-vivo calcium imaging with fiber photometry to record population level neuronal activity throughout training, punishment, and test. Finally, to manipulate the activity of discrete brain regions, we used viral-mediated expression of the inhibitory chemogenetic receptor (hM4Di), and systemic administration of the chemogenetic receptor ligand clozapine during tests for relapse. **Results.** We found higher Fos expression in the anterior insula (AI) cortex in rats tested for context-induced relapse of nicotine seeking, compared to rats tested in either the punishment context, or a control group that was trained and punished, but not tested. Using chemogenetic



inhibition of AI, we found a significant decrease in nicotine seeking during context-induced relapse, demonstrating a critical role for AI in this form of relapse. To test for the specificity of this effect, we also tested rats for context-induced relapse after extinction and found no effect of chemogenetic inhibition of AI. **Conclusion:** These studies show that punishment of nicotine self-administration is encoded as a new, context-dependent, memory. Furthermore, activity in AI is necessary for context-induced nicotine seeking after punishment, but not extinction, indicating that the neural substrates of relapse may differ depending on the motivation for abstinence.

FUNDING: Academic Institution

POD6-5

DIFFERENTIAL INVOLVEMENT OF NICOTINIC ACETYLCHOLINE RECEPTORS IN NICOTINE AND COTININE SELF-ADMINISTRATION IN MALE WISTAR RATS

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Significance: Our previous studies demonstrated that cotinine, the major metabolite of nicotine, produced its own reinforcing effects evidenced by supporting intravenous self-administration (SA) in rats. Cotinine SA resulted in blood cotinine concentrations comparable to levels seen in habitual smokers. However, receptor mechanisms underlying the reinforcing effects of cotinine remain to be determined. Cotinine appeared to be a weak agonist to nicotinic acetylcholine receptors (nAChRs), being thousands folds less potent than nicotine. However, cotinine at concentrations close to physiological levels did not appear to interact with nAChRs. The objective of the current study was to determine potential involvement of nAChRs in mediating nicotine and cotinine SA.

Methods: Adult male Wistar rats were trained to self-administer nicotine or cotinine at 0.03 mg/kg/infusion in daily 2-hr sessions for approximately three weeks. Rats were divided into groups to receive treatment with either mecamylamine (0, 0.75, 1.5, or 3.0 mg/kg, s.c.), a nonselective, noncompetitive nAChRs antagonist, or varenicline (0, 0.5, 1.0, or 2.0 mg/kg, s.c.), a partial agonist to $\alpha 4\beta 2^*$ nAChRs and a full agonist to $\alpha 7$ nAChRs. Each compound was given to only one group of rats with a within-subject design. Infusions and both active and inactive lever responses were recorded for analysis.

Results: Mecamylamine significantly reduced nicotine infusions (e.g., saline vs 1.5 mg/kg: 39 vs 21, $p < 0.05$), active responses (e.g., saline vs 3.0 mg/kg: 50 vs 25, $p < 0.05$), but not inactive responses (e.g., saline vs 1.5 mg/kg: 8 vs 12, $p > 0.05$). Mecamylamine did not alter cotinine infusions (e.g., saline vs 3.0 mg/kg: 22 vs 23), active responses (e.g., saline vs 1.5 mg/kg: 27 vs 32), or inactive responses (e.g., saline vs 1.5 mg/kg: 6 vs 5). Varenicline at 1.0 and 2.0 mg/kg significantly reduced nicotine infusions (e.g., saline vs 1.0 mg/kg: 35 vs 18, $p < 0.05$), active responses (e.g., saline vs 2.0 mg/kg: 44 vs 22, $p < 0.05$), but not inactive responses (e.g., saline vs 1.0 mg/kg: 4 vs 3, $p > 0.05$). On the other hand, varenicline did not alter cotinine infusions (e.g., saline vs 2.0 mg/kg: 43 vs 40), active responses (e.g., saline vs 1.0 mg/kg: 64 vs 63), or inactive responses (e.g., saline vs 1.0 mg/kg: 10 vs 4). **Conclusions:** These results suggest that nAChRs may be differentially involved in mediating the reinforcing effects of cotinine and nicotine, implicating the importance of targeting cotinine's effects in developing therapies for treating nicotine addiction.

FUNDING: Federal; Academic Institution

POD6-6

C57BL/6 SUBSTRAIN DIFFERENCES IN PHARMACOLOGICAL EFFECTS AFTER ACUTE AND REPEATED NICOTINE ADMINISTRATION

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Significance: Tobacco smoking is the major cause of disability and death in the United States and around the world. The World Health Organization (WHO) reports more than seven million deaths each year from direct tobacco use, estimated to rise to 10 million deaths per year by the year 2030. Many smokers still face immense difficulty quitting and remaining tobacco-free permanently despite numerous informational efforts on the hazards of tobacco smoking and other control efforts. The emergence of tobacco dependence is primarily due to the psychoactive properties of nicotine; influenced also by a complex interplay of genetics, environment, and psychological state. Mouse genetic studies could potentially elucidate novel genes and/or gene networks regulating various aspects of nicotine dependence. **Methods:** Using the closely related C57BL/6J (B6J) and C57BL/6N (B6N) mice substrains, we examined several pharmacological measures following acute and repeated administration of nicotine including locomotion, body temperature, nociception, anxiety-like behaviors and acute reward in the

conditioned place preference test. We also examined pharmacokinetic profiles of each substrain in response to nicotine. **Results:** We report significant substrain differences in the pharmacological effects of acute and repeated nicotine administration in the B6 substrains. Overall, we show enhanced nicotine sensitivity to locomotion, hypothermia, antinociception, anxiety-like behaviors and acute reward in the B6J compared to B6N. In the repeated administration paradigm, we observed no sensitization of locomotor responses in either substrain at the two doses tested. Furthermore, we find that nicotine metabolism and kinetics do not differ between both substrains after acute administration of nicotine. **Conclusion:** This study provides evidence for substrain differences in nicotine pharmacological responses of the closely related C57BL/6J after acute and repeated administration. The heritable differences in nicotine response lend themselves to genetic mapping using a reduced complexity cross strategy. Such a strategy has been successful in quantitative trait locus mapping for behavior, immunity, and physiological phenotypes; suggesting that the B6 mouse substrains may be useful for genetic studies to elucidate some of the genetic differences involved in tobacco dependence and addiction. This research was funded by the National Institute on Drug Abuse of the National Institutes of Health under Award Number P30 DA033934 and U01 DA045299.

FUNDING: Federal



PODIUM PRESENTATION 3

PAPER SESSION 7: BREATHING NEW LIFE INTO CESSATION STRATEGIES: TREATMENT UPDATES

POD7-1

UPDATE OF THE COCHRANE SYSTEMATIC REVIEW AND META-ANALYSIS OF ELECTRONIC CIGARETTES FOR SMOKING CESSATION

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Significance: We evaluated the best available evidence on the safety and effect of using electronic cigarettes (EC) to help people who smoke achieve long-term smoking abstinence. **Methods:** We searched (January 2020) for randomized trials (RCTs) and uncontrolled intervention studies testing EC interventions in smokers. Studies had to report abstinence from cigarettes at 6 months or longer and/or data on adverse events (AEs) or other safety markers at a week or longer. We used standard Cochrane methods for screening and data extraction. Where appropriate we pooled data in meta-analyses. **Results:** We include 50 completed studies (12,430 participants). There was moderate certainty evidence from 3 trials that quit rates were higher in people randomized to nicotine EC than to non-nicotine EC. There was low certainty evidence of no difference in AEs between these groups and of lower rates of serious adverse events (SAEs) in people randomized to nicotine EC. There was also moderate certainty evidence from 3 trials that quit rates were higher in people randomized to nicotine EC than those randomized to NRT. There was low certainty evidence of no difference in AEs and of higher rates of SAEs in people randomized to nicotine EC compared to NRT. There was low to very low certainty evidence for the comparison between nicotine EC and behavioural support only/no support: quit rates were higher for participants randomized to nicotine EC; rates of AEs and SAEs were higher in nicotine EC arms. Data from non-randomized studies were consistent with data from RCTs. The most commonly reported AEs were throat/mouth irritation, headache, cough, and nausea, which tended to dissipate over time. **Conclusions:** Data consistently signal benefit of nicotine EC for smoking cessation; however, more studies are needed to confirm the degree of benefit. We did not detect any clear evidence of harm; however, follow-up periods were relatively short (longest 2 years), and the overall number of participants and studies was relatively small. To ensure the review remains up to date, searches are being run monthly from September 2020, with the review updated as relevant new evidence emerges (a living systematic review format).

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD7-2

RELAPSE RECOVERY RATES IN A SEQUENTIAL, MULTIPLE ASSIGNMENT, RANDOMIZED TRIAL (SMART) OF CHRONIC CARE INTERVENTIONS FOR SMOKING

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Significance: It is unclear how best to intervene with smokers who relapse. **Methods:** Smokers interested in quitting were recruited in primary care and received Initial Cessation Treatment (8 weeks nicotine patch; <20 mins. of counseling). Relapse (smoking for the past 7 days) was assessed through 6 months. Relapsers were randomized to 1 of 3 Relapse Recovery (RR) Treatments: 1) *Smoking Reduction Counseling* + nicotine mini lozenges with regular offers of cessation treatment *after 1 month of Reduction Treatment*; 2) *Recycling* (offers of cessation treatment *beginning immediately post*

relapse); or 3) encouragement to call the *Quitline*. Those in Reduction or Recycling could engage in New Cessation Treatment and make a new quit attempt with 8 weeks of nicotine patch + mini-lozenges plus randomization to 1 of 4 counseling conditions in a factorial design: 1) Supportive Counseling + Skill Training (<3 hrs. of counseling); 2) Supportive Counseling + Brief Information (~2 hrs.); 3) Skill Training + Brief Information (~2 hrs.); or 4) Brief Information Only (15 mins.). Abstinence was assessed 14 months after starting RR treatment and—for those who engaged in New Cessation Treatment—at 6 months post their new target quit day. **Results:** Of 1154 smokers enrolled, 63% relapsed in Initial Cessation Treatment; 80% (582/728) of relapsers entered RR Treatment. A higher percentage of relapsers randomized to Recycling versus Smoking Reduction entered New Cessation Treatment (83% vs. 56%, $p < .0001$). The two groups' CO-confirmed point-prevalence abstinence rates 14 months after starting RR Treatment did not significantly differ (Recycling = 7%, Reduction = 4%), but Recycling led to significantly higher abstinence rates than Quitline referral (2%). For those who entered New Cessation Treatment ($n = 304$), self-reported point-prevalence abstinence rates 6 months post their new quit day ranged from 22% for Brief Information to 32% for Skills. There were no main effects of Skills or Support. **Conclusions:** Encouragement to quit again with study-provided cessation treatment as soon as possible post-relapse increased long-term abstinence rates relative to encouragement to contact a quitline.

FUNDING: Federal; Academic Institution

POD7-3

A COMPARISON OF SUCCESS RATE OF ENDS, NRT, OR MEDICATION IN CESSATION AMONG CIGARETTE ONLY USERS A LONGITUDINAL ANALYSIS OF PATH STUDY WAVE 3 (2015-2016) AND 4 (2016-2017) ADULT DATA

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Significance: Prior studies investigating the role of electronic nicotine delivery system (ENDS) use in cigarette cessation have largely relied on the analysis of non-representative samples. The aim of this study is to compare the cessation success rate of electronic nicotine delivery system (ENDS), nicotine replacement therapy (NRT), or medication as a cessation aid among Wave 3 cigarette only users who used these methods between Wave 3 and 4. **Method:** We used the Population Assessment of Tobacco and Health (PATH) Study Wave 3 and 4 adult data. We compared cigarette cessation rate of Wave 3 established cigarette only users who used ENDS, NRT, or medication (varenicline and bupropion) to quit smoking between wave 3 and 4. "Cessation" was defined as being a former cigarette smoker in Wave 4. A chi square test was used to assess the difference in cessation rate across aids. **Result:** Among 6,794 established cigarette only users in Wave 3, 532 used ENDS, NRT, or medication to quit smoking between Wave 3 and 4: 75 used ENDS only, 289 NRT only, 68 medication only, and 100 used a combination of NRT and medication. Overall, 16.1% ($n=86$) became former smokers. Among those who used ENDS only to quit, 16.2% ($n=14$) became former smokers. The same percentages were: 16.1% ($n=47$) for NRT, 17.7% ($n=13$) for medication, and 14.8% ($n=12$) for a combination of both NRT and medication ($p=0.97$). In total, 192 cigarette only users in Wave 3 used ENDS to quit smoking with or without other methods and none of them became ENDS only users in Wave 4, 37.6% ($n=71$) of them became dual users of both cigarette and ENDS, 52.8% ($n=100$) remained as cigarette only users, and 9.6% ($n=21$) became nonusers of any tobacco product in Wave 4. **Conclusion:** Using data from this nationally representative study, we found no difference in cessation rates for using ENDS only, NRT only, or non-NRT medication only. Cigarette smokers should be encouraged to use FDA approved cessation methods to quit cigarette smoking to reduce health risks associated with dual use of cigarette and ENDS.

FUNDING: Federal



POD7-4

IS CYTISINE AT LEAST AS EFFECTIVE AS VARENICLINE FOR SMOKING CESSATION - FINDINGS FROM A NON-INFERIORITY TRIAL IN INDIGENOUS NEW ZEALANDERS AND THEIR EXTENDED FAMILY

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Significance: Cytisine is a plant-based alkaloid, and, like varenicline, is a nicotine receptor partial agonist. As a natural product, cytisine may appeal to indigenous people who smoke. New Zealand (NZ) research indicates that because cytisine is found in some endemic plants, indigenous Māori (who are disproportionately affected by tobacco) feel a sense of *Rangatiratanga* (ownership) over it. Trial evidence indicates cytisine is superior to placebo and NRT, with few harms reported in clinical trials. The effectiveness and safety of cytisine compared to varenicline has not been assessed. We designed a pragmatic, single-blind, randomised non-inferiority trial to determine whether cytisine was at least as effective as varenicline in supporting indigenous NZ Māori (and their *whānau* [extended family]) who smoke, to remain abstinent for at least six months. **Methods:** Participants identified through multi-media advertising were: daily smokers who self-identified as Māori or *whānau* of Māori; aged ≥18 years; motivated to quit. Participants were randomised (1:1) to receive prescriptions for 12-weeks' cytisine (Tabex) or varenicline tablets (Champix). Both groups were offered brief behavioural support. The primary outcome was carbon-monoxide-verified continuous abstinence at 6 months post-quit date. Secondary outcomes at 1, 3, 6 and 12 months post-quit date included smoking, cessation, and adverse events. 2,140 participants were sought (90% power, non-inferiority margin of 10%). **Results:** 679 people were randomised (337 cytisine, 342 varenicline). Non-inferiority, but not superiority, was demonstrated at 6-months (verified continuous abstinence: 12.1% cytisine vs 7.9% varenicline; Absolute Risk Difference: 4.29, 95% CI -0.22 to 8.79; Relative Risk: 1.55, 95% CI 0.97 to 2.46). Fewer self-reported adverse events occurred with cytisine (313 events/111 participants) than with varenicline (509 events/138 participants; Incidence Rate Ratio: 0.56, 95% CI 0.49 to 0.65, $p < 0.001$). **Conclusion:** Cytisine plus behavioural support is at least as good as varenicline plus behavioural support for smoking cessation in this indigenous population and is associated with fewer adverse events.

FUNDING: Other

POD7-5

FEASIBILITY AND ACCEPTABILITY OF A MINDFULNESS-BASED mHEALTH SMOKING CESSATION INTERVENTION WITH WEARABLE SENSORS

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Relapse prevention is an important component of successful smoking cessation. Mindfulness-based strategies can strengthen an individual's ability to be present with discomfort, which can be useful when managing withdrawal symptoms and cravings to smoke that can lead to lapse/relapse. This study evaluated the feasibility and acceptability of a micro-randomized trial for delivery of mindfulness-based strategies in real-time, in the real-world via smartphone during key moments in a quit smoking attempt. Wearable sensors were used to identify key moments and response to a strategy. Participants enrolled in a 6-week cessation study that consisted of 4 in-person treatment visits coinciding with 2 weeks of mindfulness strategies and motivational messages delivered via smartphone. The follow-up visit took place 28 days post-quit date. All received NRT. Measures of feasibility were participant retention, the System Usability Scale (SUS, 0-100), and questions regarding technology. Acceptability was measured via the Client Satisfaction Questionnaire (CSQ, 1-4) and ratings of the mindfulness component of treatment. Participants (N=37) were 60% female and mean age was 48 (SD=13.89). For participant retention, 89% completed treatment and 84% completed follow-up. The mean SUS was 63.89 (SD=17.79), indicating that the system was fairly easy to use. Participants typically reported needing 2 days to get comfortable with the equipment. The mean CSQ was 3.52 (SD=0.59), indicating high treatment satisfaction. Participants rated (1-6) mindfulness strategies as helpful to manage cravings (M=4.76, SD=1.31) and stress (M=4.61, SD=1.41), and likely to continue using the skills (M=5.09, SD=1.36). Most reported that the frequency and variation of mindfulness strategies delivered was appropriate. At follow-up, 81% reported continued use of skills learned. Feasibility and acceptability of the intervention were very positive. A large-scale study to further

assess mindfulness-based strategies delivered via mHealth for smoking cessation is warranted. Funding: This study is funded by the National Institute on Minority Health and Health Disparities (R00MD010468).

FUNDING: Federal

POD7-6

BARRIERS AND FACILITATORS OF ADHERENCE TO NICOTINE REPLACEMENT THERAPY: A SYSTEMATIC REVIEW

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Introduction: The level of adherence of patients to nicotine replacement therapy (NRT) is found to be low. Adherence to NRT during quit attempt increases the success of smoking cessation by two-fold. Hence, a detailed understanding of the barriers and facilitators of adherence to NRT is critical to improve adherence and success of smoking cessation. **Methods:** A systematic review was conducted by searching five databases (MEDLINE, Scopus, EMBASE, CINAHL, and PsycINFO) and grey literature from the start of indexing to 10 May 2020 to identify studies which examined factors associated with adherence to NRT. The Joanna Briggs Institute (JBI) critical appraisal tool was utilised to assess the quality of included studies. Data extracted, analysed using thematic analysis and then factors were mapped onto the COM-B (Capability, Opportunity, Motivation, and Behaviour) model components. **Results:** A total of 25 articles were included in the systematic review. The review identified 31 patient-level factors associated with adherence to NRT. Factors categorised into the six subcomponents of the COM-B model: psychological capability (e.g., forgetfulness, level of education), physical capability (e.g., level of nicotine dependence, side effects, and withdrawal symptoms), reflective motivation (e.g., hesitance to use NRT, perceiving NRT as non-effective, perceiving quitting is a difficult process), automatic motivation (e.g., alcohol intake, anxiety, stress, depression, frequency of triggers), physical opportunity (e.g., cost of NRT), social opportunity (e.g., level of social support). **Conclusions:** The current review demonstrated the importance of multiple personal, social, and environmental factors affecting adherence to NRT using a comprehensive theoretical model. The findings of this study demonstrated the necessity of developing, evaluating, and implementing a multifaceted intervention strategy at a policy, facility, health professional, and individual level.



PAPER SESSION 8: THE HEALTH ECONOMICS OF TOBACCO USE AND VAPING

POD8-1

A MULTI-DISCIPLINARY INVESTIGATION INTO THE DRIVERS OF SMOKING CESSATION IN FIVE COUNTRIES WITH ANDS MARKETS

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Since 2010, several nations with impressive histories of smoking cessation have witnessed the proliferation of Alternative Nicotine Delivery Systems (ANDS). Different nations have taken radically different policy approaches to ANDS, ranging from outright bans to actively encouraging use by current smokers. ANDS regulations inherit a legacy of their nations' historical tobacco control policies, and national policies help determine the benefit or harm that ANDS confer. But the relationship between policies and ANDS-related outcomes is not well-understood. Applying the 'lessons learned' in one locale to drive cessation elsewhere requires that we account for these contextual specifics. This paper synthesizes the findings from case studies of Australia, Canada, Japan, South Korea and the UK. Each draws on an interdisciplinary framework for investigation combining sociological, ethnographic, policy analytic and econometric disciplinary approaches into a schema for studying the drivers of smoking cessation at the individual, micro, meso and macro levels. Data on ANDS use, smoking, and cessation from four decades is used to investigate the relationship between tobacco control policies, ANDS use and smoking cessation, as well as other salient aspects of the national tobacco control landscape. Specific policy recommendations are developed. Taxation and Stop Smoking Services (SSS) were among the most effective cessation drivers. Smoke free laws also seem to have had some effect, though other policies that sought to reduce the appeal or opportunity to smoke (plain pack legislation, health warnings and smoke-free laws, etc.) were less associated with short term reductions in smoking prevalence, though these may yet reduce national smoking rates by discouraging uptake among future generations. Tobacco use continues to be concentrated in socially and economically disadvantaged groups. Where regulations allowed, ANDS (e-cigarettes and heated tobacco in particular) were associated with smoking cessation. Moreover, instances of tobacco use declining even as e-cigarette use increased suggests that e-cigarettes do not necessarily re-normalize tobacco use as feared. The results demonstrate how policy decisions affect ANDS use and the latter's value as a cessation mechanism. The authors recommend that regulators continue to increase tobacco taxes carefully and study how to integrate ANDS with well-funded SSS. Regulators should also seek policies that differentiate among nicotine products with respect to their harms profiles. Future cessation programs should target socially and economically disadvantaged groups where tobacco harms continue to be concentrated. This research also highlights the need for high quality open-access data collection and analysis, especially regarding use of ANDS

FUNDING: Nonprofit grant funding entity

POD8-2

THE IMPACT OF A REGIONAL HEALTH PROMOTION PROGRAM ON QUITLINE CALLS IN CENTRAL QUEENSLAND, AUSTRALIA-FINDINGS FROM A CONTROLLED INTERRUPTED TIME SERIES ANALYSIS

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Significance: The prevalence of smoking in Central Queensland (CQ) is higher than the state and national average (16.7%, 11.9% and 14.3%, respectively). A regional smoking cessation initiative ("10,000 Lives") was launched in CQ in November 2017 to reduce the number of adult smokers by promoting available interventions (e.g. Quitline). We investigated the impact of "10,000 Lives" on referral to and use of Quitline in CQ. **Method:** We conducted a controlled interrupted time series analysis using a segmented Poisson regression model to measure the impact of "10,000 Lives" on monthly referrals (self or third party referrals) to, participation (i.e. made at least the first call) and interaction (i.e. number of calls) with Quitline from smokers in CQ compared to smokers in other areas in the state (the control population). The pre and post launch periods of "10,000 Lives" were January 2014 to August 2017 and November 2017 to December 2019.

The control population included other regional areas in Queensland with a comparable smoking prevalence and similar access to Quitline's intensive quit support program. We calculated the level and trend change in CQ and compared them with those observed in control population. The models were checked for autocorrelation and seasonality and adjusted accordingly. **Result:** Increases in monthly referrals, participation and interaction of 162.8%, 121.8% and 210.5% respectively were observed in the post launch period in CQ compare to 22.2%, 0.3% and 46.1% respectively in the control population. The interrupted time series analysis indicated a significant increase in the level ($P < 0.000$ for each outcomes) with a minimal change in trend ($P > 0.165$ for each outcomes) of monthly referrals, participation and interaction with Quitline in CQ after introduction of "10,000 Lives" compared to the control population. In CQ, the level of monthly referrals, participation and interaction with Quitline increased 3.0 (2.5-3.5) times, 2.8 (2.3-3.3) times, and 3.0 (2.5-3.5) times, respectively in the post launch period. Whereas in the control population, the number of referrals were 1.1 (0.98- 1.3) times the referrals in the pre-launch period, and participation rate was 1.3 (1.1-1.5) times higher, and interaction rate was 1.5 (1.3 - 1.7) times higher in the post launch period. **Conclusion:** Our study demonstrates a low cost health promotion initiative can promote and boost the referral to and use of the Quitline smoking cessation service in regional Australia.

FUNDING: Unfunded

POD8-3

SUBSTITUTABILITY OF COMBUSTIBLE TOBACCO CIGARETTES AND E-CIGARETTES IN DUAL USERS AND EXCLUSIVE E-CIGARETTE USERS

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Significance: Policies and regulations to curb tobacco use may have unintended consequences. To understand potential effects of price regulations, we examined the substitutability of combustible tobacco cigarettes (CTC) or e-cigarettes among dual CTC/e-cigarette users and exclusive e-cigarette users. **Methods:** As part of a clinical laboratory experiment, we recruited $n=17$ dual users and $n=19$ exclusive e-cigarette users ages 21-55. Dual users reported daily use of CTC and someday use of e-cigarettes or vice versa. Exclusive e-cigarette users reported daily e-cigarette use and no past-month CTC use, though 95% had tried CTC before. During one laboratory visit, participants completed computerized cross-price purchase tasks in which they reported demand for two concurrently available tobacco products, one offered at a series of increasing prices (\$0-\$10.24 USD/10 puffs) while the alternative was offered at a fixed price of \$1/10 puffs. Dual users completed two tasks: in the first task, own-brand e-cigarettes were available at \$1 while own-brand CTC were available at a series of increasing prices; in the second task, the two products were reversed. Exclusive e-cigarette users completed one task in which they reported demand for a generic CTC available at a fixed price of \$1 while their own-brand e-cigarettes were available at a series of prices. Linear mixed effects models evaluated the cross-price elasticity of each alternative product. **Results:** Among dual users, e-cigarettes were found to be substitutes for CTC ($B=0.35, p<0.001$); within this population, CTC also substituted for e-cigarettes ($B=0.28, p<0.001$). Among exclusive e-cigarette users, generic CTC functioned as substitutes for e-cigarettes ($B=0.29, p<0.001$). **Conclusion:** For dual CTC/e-cigarette users, as prices for one product rose, consumption of the alternative product increased, suggesting that each product serves as a substitute for the other. Moreover, exclusive e-cigarette users may substitute CTC for their own e-cigarettes if prices for e-cigarettes rise. Policymakers aiming to curb tobacco use should consider how increasing prices for certain tobacco products may result in substitution between products.

FUNDING: Federal

POD8-4

ESTIMATING THE IMPACT OF TOBACCO CONTROL SPENDING ON U.S. HIGH SCHOOL STUDENT VAPING USE BY GENDER

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Significance: In 2014, less than a decade from entering the U.S. market, e-cigarettes replaced traditional cigarettes as the most commonly used tobacco product by youth in the United States. While traditional cigarettes have historically higher rates of use among

**PAPER SESSION 9: INTERVENTIONS FOR VULNERABLE POPULATIONS****POD9-1****PROJECT ASSIST (ADDRESSING SMOKING IN SHELTERED HOMELESS WITH INTENSIVE SMOKING TREATMENT) A PILOT STUDY EXAMINING THE SAFETY AND EFFECTIVENESS OF VARENICLINE, COMBINATION NICOTINE REPLACEMENT THERAPY, AND COUNSELLING IN MALE ADULT TOBACCO SMOKERS AT RISK OR EXPERIENCING HOMELESSNESS**

Eliza Skelton¹, Alistair Lum¹, Lucy Cooper², Emma Barnett³, Julie Smith⁴, Arlene Everson³, Jane Machart³, Amanda Baker¹, Sean Halpin¹, Olav Nielssen⁵, Billie Bonevski¹. ¹The University of Newcastle, Callaghan, Australia, ²St Vincent's de Paul Society NSW, Sydney, Australia, ³St Vincent's de Paul Society NSW, Sydney, Australia, ⁴St Vincent's de Paul Society NSW, Callaghan, Australia, ⁵Macquarie University, Sydney, Australia.

Significance: Smoking among people who are homeless or at risk of homelessness continues to be a major public health problem. Addressing smoking among people who are homeless is a neglected area and strategies to support people who are homeless to quit smoking are required to determine the best method to support these smokers to quit. This is the first study to evaluate a 12-week intervention involving varenicline, combination NRT, and motivational interviewing for people who are homeless or at risk of homelessness. This study aims to i) assess the neuropsychiatric safety of the intervention; ii) test the effectiveness of the intervention at improving abstinence and reducing cigarettes smoked per day; iii) test the effectiveness of the intervention at reducing nicotine cravings, withdrawal symptoms, and psychological distress; iv) assess the acceptability of the intervention. **Methods:** A single arm, uncontrolled pre and post-test 12-week smoking cessation intervention consisting of varenicline, combination nicotine replacement therapy, and counselling (motivational interviewing). Participants were a convenience sample of 20 smokers who were homeless or at risk of homelessness from a health clinic located within a men's hostel located in Sydney, Australia between December 2019 and March 2020. Neuropsychiatric adverse events, self-reported abstinence, cigarettes per day, treatment adherence and acceptability of the study interventions were assessed at week 12. Results are reported for complete cases. **Results:** Retention was 65% at 12-weeks. Two adverse events and two serious adverse events were reported. None were related to the study intervention. Three participants (23.1%) reported continuous abstinence from their target quit date. Two participants self-reported 30-day point prevalence abstinence (15.4%), both biochemically verified. Among participants who did not quit smoking, there was a significant reduction in the number of cigarettes smoked per day (19.4 vs 4.7, $p < .01$). Participant reported cravings, withdrawal symptoms, and psychological distress significantly decreased from baseline to 12-week follow-up (all $< .01$). Adherence to the study intervention was good with the majority attending counselling sessions and using combination NRT and varenicline. Overall, the acceptability of varenicline, NRT, and counselling for smoking cessation was high. **Conclusions:** This study found no neuropsychiatric adverse events attributable to the study. Providing varenicline, combination NRT, and counselling led to successful quit attempts and significant reductions in the number of cigarettes per day. Intervention adherence and acceptability was high. Given the demonstrated safety of this intervention, further research to determine the effectiveness of this approach is warranted.

FUNDING: Nonprofit grant funding entity

POD9-2**TOBACCO CONTROL MESSAGES AND THE NEEDS OF PREGNANT ABORIGINAL AND TORRES STRAIT ISLANDER WOMEN**

Gillian S. Gould, Gina La Hera Fuentes, Michelle Bovill, Jessica Bennett, Allison Hart, Nicole Ryan. The University of Newcastle, Newcastle, Australia.

Significance: The needs of a target audience are paramount when designed media campaigns. During pregnancy, Aboriginal women are motivated to quit smoking, yet may receive sub-optimal support to do so. Smoking prevalence among pregnant Aboriginal women is high at 44%. We summarised the literature about knowledge, attitudes and values of Aboriginal women who smoke during pregnancy and evaluated existing media campaigns to determine how they aligned. **Methods:** Electronic databases were searched for empirical studies related to tobacco smoking in Aboriginal pregnant women. Social media and Google were searched using combinations of terms related

male high school students compared to their female counterparts, e-cigarette use in 2014 did not significantly differ by gender. In 2019, 27.5% of U.S. high school students reported e-cigarette use, a 76% increase from the previous year. Female students who were never users were also found to be more susceptible to e-cigarette use than male never users. Though state and national tobacco control programs have funded numerous anti-tobacco activities that have proven to reduce traditional cigarette use, there are no current studies that examined the same effect on youth e-cigarette use. The current study examines the impact of state tobacco control spending on e-cigarette prevalence and intensity by U.S. high school students and examines the differential impact by gender. **Methods:** Using 2011-2019 state-level National Youth Tobacco Survey data, this study employed Probit and a Generalized Linear Model with log-link and gaussian distribution methods to model female and male high school student vaping prevalence and intensity. Predicted prevalence and intensity measures were used to simulate how various levels of state tobacco control spending would affect these rates. **Results:** After controlling for unobserved state level heterogeneity, the estimates imply an inverse relationship between real per capita tobacco control spending for both vaping prevalence and the number of days vaped by high school students. Had states increased their spending by 50% during the time of the survey, male and female high school student prevalence would have decreased 11% and 7% respectively; vaping days would have decreased 27% and 17% respectively. **Conclusion:** No national level econometric studies to date have examined the effect of tobacco control spending on high school male and female prevalence and intensity. Findings from this study provide strong evidence to support funding for state tobacco control programs.

FUNDING: Other

POD8-5**THE EFFECTS OF E-CIGARETTE TAXES ON E-CIGARETTE PRICES AND TOBACCO PRODUCT SALES - EVIDENCE FROM RETAIL PANEL DATA**

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Significance: The rapid rise in e-cigarette use has led to concerns among public health officials and a focus on tobacco control policies aimed at curbing e-cigarette use. As of March 15, 2020, 23 states have enacted an e-cigarette tax. Despite the rapid increase in e-cigarette use, very little is known about the effects of these policies on the use of e-cigarettes or other tobacco products. **Methods:** We explore the effect of e-cigarette taxes enacted in eight states and two large counties through 2017 on e-cigarette prices, e-cigarette sales, and sales of other tobacco products. We develop a method to standardize e-cigarette taxes as adopting localities have taxed these products in heterogeneous ways. We use Nielsen Retail Scanner data from 2011 to 2017, comprising approximately 35,000 retailers nationally. We estimate difference-in-difference-like regression modelling that controls for locality fixed effects, year-by-quarter fixed effects, other tobacco control policies, and demographics. **Results:** We estimate a tax-to-price pass-through rate of 1.5, meaning that e-cigarette prices rise by \$1.50 for every \$1.00 increase in e-cigarette taxes. In line with the estimated over-shifting of taxes to prices, we calculate a Herfindahl-Hirschman Index of 0.245 for e-cigarette retail purchases, indicating a moderately to highly concentrated market, a setting in which over-shifting is likely. We then calculate an e-cigarette own-price elasticity of -1.3 and positive cross-price elasticity of demand between e-cigarettes and traditional cigarettes, suggesting that e-cigarettes and traditional cigarettes are economic substitutes. We also find that taxes disproportionately reduce flavored e-cigarette product sales. **Conclusion:** Our study suggests that, as intended, e-cigarette taxes raise e-cigarette prices and reduce e-cigarette sales. However, an unintended effect is a sizable increase in traditional cigarette sales.

FUNDING: Federal



to Aboriginal smoking and health messaging. We included studies privileging Aboriginal women's voices and information for Aboriginal pregnant women and families. Quality of peer-reviewed papers was assessed by two reviewers. We analysed the extent to which the peer-reviewed papers and the health promotion materials aligned with the seven domains of the Aboriginal Social and Emotional Wellbeing (SEWB) Model and the Behaviour Change Wheel (BCW) Framework. Results: 11 peer-reviewed articles and 18 campaigns were included. There was variance in the alignment of the research evidence and health promotion materials according to the Aboriginal SEWB Model and the BCW. Topics well covered and highly aligned included: risks from smoking, issues related to quitting, and engagement with family and community; topics less well aligned were connection to country, spirit and ancestors. Despite 'engagement with family and community' being an important theme in the included papers, few media campaigns targeted family alongside pregnant women. Conclusion: This rapid review of the literature uniquely used an Aboriginal and a Western framework to synthesise peer-reviewed literature privileging Aboriginal women's voices and matched results to existing media campaigns for tobacco control in pregnancy. The campaigns covered much of the literature, but gaps were evident. The success of government strategies for tobacco control is dependent on adopting evidence-based approaches that are tailored to the needs of Aboriginal women.

FUNDING: Federal; Nonprofit grant funding entity

POD9-3

A PILOT STUDY OF ABRUPT VERSE GRADUAL SMOKING CESSATION IN COMBINATION WITH ELECTRONIC NICOTINE DEVICES FOR SMOKERS RECEIVING ALCOHOL AND OTHER DRUG TREATMENT

Eliza Skelton¹, Alistair Lum¹, Maryanne Robinson¹, Adrian Dunlop², Amanda Baker¹, Coral Gartner³, Ron Borland⁴, Billie Bonevski¹. ¹The University of Newcastle, Callaghan, Australia, ²Hunter New England Local Health District, Newcastle, Australia, ³University of Queensland, Brisbane, Australia, ⁴University of Melbourne, Callaghan, Australia.

Significance: This pilot study with people in drug and alcohol treatment trying to quit smoking using vaporised nicotine products (VNPs) had four aims: i) To test the effectiveness of abrupt versus gradual reduction cessation strategies at improving cessation and reducing cigarettes smoked per day; ii) measure preferences for abrupt cessation vs gradual reduction strategies; iii) assess adherence to abrupt cessation vs gradual reduction schedules; iv) assess the acceptability of the VNPs. **Method:** We conducted a pragmatic randomised controlled trial between April 2018 and July 2019. Sixty participants recruited from two treatment programs (one for opiate use and one for cannabis use) were given a one week support of nicotine patches (21mg), two VNPs and a 12-week supply of prescribed nicotine e-liquid to help them quit smoking as well as randomised to either gradual or abrupt cessation quit strategies. Participants assigned to the abrupt cessation condition were informed upon receiving the intervention that this was their target quit date. Participants assigned the gradual reduction condition were provided with a personalised cessation schedule based upon their baseline number of cigarettes per day that decreased by 25% over a 4-week period. **Results:** Of the 52 participants that completed the 12-week survey (86.6%), 25% (n=15) self-reported 7-day point prevalence abstinence. Of these 29.6% in the gradual cessation group and 29.2% in the abrupt cessation group reported abstinence, which was not significantly different. Overall, more participants preferred a gradual reduction approach (57.6%) to quitting smoking compared to abrupt cessation method (31.8%) while a small proportion had no preference (10.6%). At the 12-week follow-up survey, less than half (44%) of participants in the gradual reduction condition reported using their personal quit plan while over two thirds (71%) of participants randomised to the abrupt cessation condition reported quitting on their target quit date. Acceptability of the VNPs was high among both abrupt cessation and gradual reduction participants with nearly all agreeing that they were effective at reducing their cravings (95% vs 100%) and that it was easy to use (96% vs 92%). **Conclusions:** This study found that, for people using VNPs to quit smoking, abrupt cessation or gradual reduction methods are likely to be equally effective and acceptable suggesting that smokers should be encouraged to use the method they prefer and are more likely to adhere to. Given this was a small trial, further research examining optimal quit support strategies for smokers using VNPs to quit is warranted.

FUNDING: Unfunded

POD9-4

LGBTQI2S YOUNG ADULT SMOKING EXPERT INTERVIEWS AND LITERATURE SYNTHESIS

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Significance: Research has suggested a number of reasons why smoking rates are high among LGBTQI2S+ communities: minority stress and stigma, discrimination, targeted marketing by the tobacco industry, and normative behaviours within the communities. Smoking rates differ across sub-communities by sexual orientation and gender identity. This study seeks to better understand why smoking rates are high in these communities and how to develop tailored cessation services. **Methods:** A literature search and environmental scan was conducted to identify current research on LGBTQI2S+ smoking patterns and cessation initiatives. Literature on LGBTQI2S+ smoking behaviours, cessation approaches, impacts of stigma and stress as well as literature from other substance use were searched. We conducted 10 key informant interviews with experts in the fields of LGBTQI2S+ health across Canada, the United States and Australia. Interview transcripts were analyzed by extracting the main themes that arose. **Results:** Preliminary results show a strong relationship between minority stress and smoking behaviours among LGBTQI2S+ young adults. Stress was described in various forms including family unacceptance, the experience of 'othering', violence and discrimination. Broader social determinants of health and the intersectionality of other issues related to mental health, insufficient housing and employment were also identified as factors affecting smoking rates. Normative behaviours in the LGBTQI2S+ communities were identified as major contributors to higher smoking rates in these populations. Broad social norms include the neighbourhoods where people live, media people consume, and organizational policies. Key informant for cessation services could include virtual and in-person support groups and online supports including text-based services. **Conclusions:** Rates of smoking are higher among LGBTQI2S+ young adults compared to cisgender straight counterparts. More tailored marketing campaign and safe cessation services are required.

FUNDING: Federal

**PAPER SESSION 10: UNDERSTANDING NICOTINE DEPENDENCE AND SMOKING CESSATION IN THE CONTEXT OF HIV****POD10-1****INCREASE OF NICOTINE WITHDRAWAL INTENSITY IN A MOUSE MODEL OF HIV TAT NEUROPATHY**

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Clinical studies have been shown a high co-occurrence of chronic pain and smoking dependence. There is also evidence that nicotine can cause state of acute analgesia, and that nicotine abstinence/withdrawal can induce hyperalgesia. Evidence from Ditre and Brandon (2008) suggested that pain can be a potent motivator of smoking. Furthermore, rates of current smoking among HIV- population remain 2-3 times higher than that of the general population. Nonetheless, preclinical investigations modelling this interaction between nicotine dependence and pain are lacking, thus providing a major obstacle to study the mechanisms of pain-related nicotine dependence. To address this deficit in preclinical models, we hypothesized that chronic neuropathic pain states alter nicotine dependence aspects, and the present study examines nicotine withdrawal in HIV-induced neuropathy (mice conditionally expressing HIV Tat1-86 protein) mice. Nicotine withdrawal somatic and affective signs increased in intensity in Tat +/- female mice after long term of doxycycline exposure. In addition, acute responses of nicotine of Tat mouse model did not change at two different doses of nicotine. Furthermore, plasma nicotine was significantly higher in Tat +/- mice, but nicotine ratio n (brain/plasma) was significantly lower in Tat +/- mice. Taken together, these findings showed that mice are more susceptible to nicotine withdrawal after long term doxycycline exposure. These changes suggest increase susceptibility to nicotine dependence in chronic neuropathic pain.

FUNDING: Federal

POD10-3**CIGARETTE SMOKING STATUS, DEPRESSION, ANXIETY, AND MEDICATION ADHERENCE IN A SAMPLE OF PERSONS LIVING WITH HIV/AIDS**

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Significance: Cigarette smoking occurs at high prevalences among people living with HIV (PLWH) and smoking is associated with both higher depression and lower medication adherence. Little is known about the potential interactive relationship of cigarette use and mood related to medication adherence. The study examined cigarette smoking, depression, anxiety, and medication adherence within a sample of adult PLWH. **Methods:** Adult (18+) PLWH were recruited from the Center of Positive Living at the Montefiore Medical Center (Bronx, New York, US). Participants reported demographics, smoking behaviors, mood symptoms (PROMIS-Depression, Beck Anxiety Inventory), and medication adherence (Simplified Medication Adherence Questionnaire). Participants' cigarette smoking statuses were confirmed through expired carbon monoxide levels. Variables (i.e., smoking, depression, anxiety) were examined both independently and combined with regard to medication adherence using independent samples t-tests, binary logistic regression, and linear regression as appropriate. **Results:** Two hundred eighty-five adult PLWH ($M_{age}=50.6$ years, 56.1% male, 50.9% Black, 51.6 % Latino/a, 50.2% current cigarette use) completed the study. PLWH with cigarette use reported significantly higher average depressive symptoms than PLWH without cigarette use ($t=2.630$, $p=0.009$) and greater depression symptoms were associated with a greater report of medication non-adherence. Cigarette use status and anxiety were not significantly related to medication adherence ($ps>0.05$). In models that examined anxiety, depression, smoking status, and demographics, depression was the only variable significantly related to medication adherence such that greater depression was associated with medication non-adherence. **Conclusion:** Among a sample of adult PLWH, greater depression symptoms were significantly associated with both current cigarette use and medication non-adherence. Given the high prevalences of cigarette use, depression, and medication non-adherence in the HIV community, it may be useful to examine whether depression-based interventions improve smoking cessation outcomes and medication adherence among PLWH.

FUNDING: Federal; Academic Institution

POD10-4**DEVELOPING A MINDFULNESS SMOKING CESSATION APPLICATION FOR PEOPLE LIVING WITH HIV, RESULTS FROM QUALITATIVE ASSESSMENT**

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Objectives: Half of people living with HIV (PLWH) are cigarette smokers. Stress and craving are major predictors of smoking relapse in PLWH. *Mindfulness Training* (MT) is effective in reducing stress and controlling craving to smoke. Contingency Management (CM) improves cessation in hard-to-treat smokers. Smartphone applications (app) improve access to treatment. We sought to adapt and optimize an evidence-based MT smoking cessation app, "*Craving to Quit*," to PLWH by integrating CM and self-monitoring strategies to improve adherence to anti-retroviral therapies (ART). **Methods:** We conducted 8 focus groups among PLWH smokers ($n=59$; 47.5% females; ≥ 18 yr.). Participants received a video demonstration about the app content. Focus group discussion entailed 3 segments exploring barriers to quitting smoking, thoughts concerning the app, and adding CM and tracking adherence to ART. Sessions were audio-taped, transcribed verbatim, and analyzed thematically using NVivo. **Results:** Most participants were non-Hispanic black (67.8%) and heterosexual (79.7%), and 30.5% were heavy alcohol users and 44.1% were depressed. In focus group discussions, participants reported multiple substance use, being surrounded by smokers, and stressful events as tremendous challenges to quit smoking. Participants felt that the app design, videos, MT, and messages were attractive, informative, and effective in motivating quit attempts. To improve the app, participants recommended adding information about the harmful effects of smoking on PLWH and information on medications used in tobacco treatment, and complementing the app with in-person group counseling to receive more support. Participants considered receiving \$20-\$50 cash incentives helpful in supporting quit attempts. Most participants thought that adding self-monitoring strategies to improve adherence to ART is helpful, but a few were concerned about confidentiality in case they lost their phone. **Conclusions:** Findings from this formative assessment underscore the need for comprehensive approaches to improve smoking cessation in PLWH. Further studies are needed to test the effect of these strategies in improving smoking cessation among PLWH.

FUNDING: Federal; State; Nonprofit grant funding entity



PAPER SESSION 11: E-CIGARETTE AND TOBACCO USE DURING A GLOBAL PANDEMIC

POD11-1

EFFECT OF THE COVID-19 PANDEMIC ON PERCEIVED RISK, ATTITUDES AND BEHAVIOR OF CIGARETTE SMOKERS PREVIOUSLY ENROLLED IN A SMOKING CESSATION TRIAL

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Background: Cigarette smoking may increase the risk of severe COVID-19 infection. Whether the pandemic has altered smokers' risk perceptions, motivation to quit or cigarette consumption is unknown. **Methods:** We assessed these factors during the U.S. COVID-19 pandemic (April-June 2020) with a phone/text survey of 1324 previously-hospitalized smokers who had enrolled in a 3-site (MA, PA, TN) smoking cessation trial before COVID-19 (9/2018-3/2020). Survey questions assessed perceived risk of COVID-19 due to smoking, smokers' interest in quitting and change in amount smoked. Multivariate analyses identified associations among these factors adjusting for age, sex, race, site, enrollment date, cigarettes/day, and perceived financial stress. **Results:** 694 participants (40% male, 78% white, mean age=53y, 66% current smokers, 34% former smokers) completed surveys (52% response). Overall, 68% believed that smoking increased the risk of contracting COVID-19 or having a more severe case. Perceived COVID-19 risk was higher in former vs. current smokers (AOR 2.30, 95% CI, 1.56-3.39) and in MA, which was in a COVID surge, vs. PA/TN sites that were pre-surge (AOR 1.61, 95% CI, 1.10-2.34). Among current smokers, 41% reported increased interest in quitting, 46% no change, 13% decreased interest. While 32% decreased the amount they smoked or quit, 35% reported smoking more. Higher perceived COVID-19 risk was associated with increased interest in quitting (AOR 1.69, 95% CI, 1.02-2.86) but not with a change in the amount smoked. Smokers with more financial stress (AOR 2.09, 95% CI 1.27-3.44) and women (AOR 2.15, 95% CI, 1.30-3.54) were more likely to report increased smoking during COVID-19. **Conclusions:** Most smokers believed that smoking increased the risk of COVID-19, especially those living in a state with a COVID-19 surge. Smokers' responses to the threat varied. Higher perceived vulnerability was associated with more interest in quitting but not with less smoking. One in 3 smokers smoked more; financial stress was associated with increased smoking. Qualitative research is underway to further explore smokers' behavior during COVID-19 and help tailor cessation treatment to the stresses of this ongoing pandemic.

FUNDING: Federal

POD11-2

TEEN VAPING EPIDEMIC MEETS COVID-19 PANDEMIC - VAPING ATTITUDES AND BEHAVIORS AMONG U.S. TEENS DURING A GLOBAL PANDEMIC

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Significance: Teen vaping in the U.S. has soared such that it has been labeled an epidemic by the Surgeon General. Addressing teen vaping through health communication campaigns requires keeping pace with factors that may affect teen behavior, such as the stay-at-home orders that went into effect in the U.S. starting in March 2020 in response to the COVID-19 pandemic. While lifestyles and daily activities undoubtedly shifted, impacts on teen vaping attitudes and behavior are not known. With COVID-19 coming at the height of the teen vaping epidemic, to uncertain effect, we sought to understand the impact of COVID-19 on teens' vaping attitudes and behaviors to inform messaging strategies for a vaping prevention campaign. **Methods:** Amidst the COVID-19 pandemic, 46 online one-on-one interviews were conducted in May-June 2020 with 13-18 year-olds in two U.S. states. Teens were primarily recruited via social media ads on Instagram/Facebook. All participants either ever vaped (78%) or were susceptible to vaping (22%). Interviews included surveys assessing vaping behaviors and attitudes, and discussion about vaping and current events. **Results:** Participants had a mean age of 16 and 41% were non-White. Half of teens who had ever vaped reported using in the past 30 days during the stay-at-home order, with disposable vapes (e.g., Puff Bar, Blu) being most

commonly used. Discussions revealed that teens who vaped fairly regularly prior to stay-at-home orders were vaping more while at home to cope with boredom and isolation from friends. While some indicated that vapes were more difficult to buy, teens identified new sources to maintain access (e.g., social media, online stores, peers). In contrast, teens who vaped occasionally prior to stay-at-home orders reported vaping less while at home because they typically only vaped in social settings or used a friend's device, and thus had fewer opportunities/triggers. Occasional vape users saw stay-at-home orders as an opportunity to quit or cut back. Overall, many had tried to quit vaping in the past 30 days, and almost 40% of current vape users wanted to quit within the next month. **Conclusions:** Obtaining timely feedback from teens is critical to understanding the contextual factors impacting vaping behavior. Findings suggest that while access to vapes remained fairly constant, COVID-19 impacted teens' behaviors and attitudes towards vaping. Opportunities to draw on current events and leverage teens' desire to quit vaping should be explored further in campaign messaging to motivate behavior change.

FUNDING: State; Nonprofit grant funding entity

POD11-3

EXPLORING LONG-TERM, OLDER SMOKERS' ATTITUDES TOWARDS SMOKING CESSATION AND MOTIVATION TO QUIT DURING THE COVID-19 PANDEMIC: A MIXED-METHODS STUDY

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Significance: Smokers are at an increased risk of COVID-19 infection and severe disease due to older age, long-term smoking histories, and underlying health conditions. This mixed-methods study sought to understand the impact of COVID-19 on older smokers' attitudes toward smoking and motivation to quit. **Methods:** Participants (N=34) were enrolled in a randomized controlled smoking cessation trial conducted in the lung cancer screening setting. During phone counseling sessions (March-May 2020), we assessed overall concern about the pandemic (not at all, a little, somewhat, extremely), amount smoked (decreased, increased, stayed the same), and motivation to reduce/quit smoking (decreased, increased, no effect). Guided by Consensual Qualitative Research guidelines, four coders transcribed and coded counseling sessions and reached consensus on the most frequently discussed topics: perceived risk of contracting COVID-19, additional stressors due to COVID-19, habits related to smoking, and attitudes toward smoking. **Results:** The mean age was 62 years (SD=6.0), 85% were non-Hispanic White, 53% were female, 38% had > Bachelor's degree, and 79% reported >1 tobacco-related comorbidity. The average smoking history was 39.9 pack years (SD=14.9), 71% were current smokers, and 29% had quit within the past 3 months. One-half stated they were extremely concerned with COVID-19 (52.9%; N=18) and of those, 50% (N=9) stated that their motivation to quit had increased. Among those less than extremely concerned with COVID-19 (47%; N=16), most reported no change in motivation (87.5%; N=14) or amount smoked (56%; N=9). Qualitative analyses indicated that some were motivated to reconsider their smoking habits due to personal risk factors for contracting COVID-19 or having additional complications if they were infected. For others, pandemic-related stressors (e.g., financial concern, concern for family, overall uncertainty) presented additional barriers to become motivated/make changes. **Conclusion:** The lockdown order provided an opportunity to make changes for some, but exacerbated triggers for others. At least half of participants expressed both extreme concern regarding COVID-19 and increased motivation to reduce/quit smoking, indicating that this pandemic could make them reassess long-term smoking habits. Most were still processing how COVID-19 was affecting their routine and amount smoked. It will be valuable to continue assessing changes resulting from the ongoing pandemic to support smoking cessation efforts among long-term smokers.

FUNDING: Federal

POD11-4

COVID-19, SMOKING, VAPING AND QUITTING - A REPRESENTATIVE POPULATION SURVEY IN ENGLAND

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Aims: To estimate 1) associations between self-reported COVID-19, hand washing, smoking status, e-cigarette use, and nicotine replacement therapy (NRT) use and 2) the extent to which COVID-19 has prompted smoking and vaping quit attempts, and



more smoking inside the home. **Design:** Cross-sectional household surveys of a representative sample of the population in England from April-May 2020. **Participants:** The sample included 3,179 adults aged ≥ 18 years. **Measurements:** Participants who reported they definitely or think they had coronavirus were classified as having self-reported COVID-19. Participants were asked how often they wash their hands after returning home, before eating, before preparing foods or before touching their face. They were also asked whether, due to COVID-19, they had i) attempted to quit smoking, ii) attempted to quit vaping, and iii) changed the amount they smoke inside the home. **Findings:** Odds of self-reported COVID-19 were significantly greater among current smokers (20.9%, adjusted odds ratio [OR_{adj}]=1.34, 95% confidence interval [CI]=1.04-1.73) and long-term (>1-year) ex-smokers (16.1%, OR_{adj}=1.33, 95%CI=1.05-1.68) than never smokers (14.5%). Recent (<1-year) ex-smokers had non-significantly greater odds of self-reported COVID-19 (22.2%, OR_{adj}=1.50, 95%CI=0.85-2.53, Bayes factor=0.55-1.17). Bayes factors indicated there was sufficient evidence to rule out large differences in self-reported COVID-19 by NRT use and medium differences by e-cigarette use. With the exception of hand washing before face touching, engagement in hand washing behaviours was high (>85%) regardless of nicotine use. A minority (12.2%) of past-year smokers who made a quit attempt in the past three months were triggered by COVID-19, and approximately one-in-ten current e-cigarette users reported attempting to quit vaping because of COVID-19. Most people reported smoking the same amount inside the home. **Conclusions:** In a representative sample of the adult population in England, current smokers and long-term ex-smokers had higher odds of self-reported COVID-19 than never smokers in adjusted analyses, but there were no large differences by NRT or e-cigarette use. In general, engagement in hand washing was high regardless of nicotine or tobacco use. A minority of past-year smokers and current e-cigarette users, respectively, attempted to quit smoking/vaping due to COVID-19.

FUNDING: Nonprofit grant funding entity

POD11-5

THE IMPACT OF COVID-19 ON SMOKERS' BEHAVIOUR: FINDINGS FROM A PRE- AND POST-COVID-19 SURVEY OF SMOKERS IN PAKISTAN

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Introduction: The COVID-19 pandemic and the subsequent lockdown measures influenced health behaviours. The interaction between the pandemic and smoking behavior is complex with factors such as psychological stress influencing changes in both directions. In addition to smokers' risk perception, access, affordability and opportunity to smoke might have driven down its use. For some smokers, mental stress, anxiety, social isolation and lack of access to cessation support might have increased consumption. We investigated the impact of the pandemic on smoking behaviours in Pakistan. Methods: We conducted pre- and post-COVID-19 panel surveys among 15+ daily smokers in Pakistan. Smokers were recruited using a two-stage random probability sampling. In the pre-COVID-19 survey (wave 1), the participants were asked about their socio-demographic characteristics and smoking behaviours. In the post-COVID-19 survey (wave 2) -conducted over phone- smokers were asked to report any changes in their smoking behaviours. Additional variables included housing, economic and food security, and mental health and wellbeing scales. We estimated the proportion of smokers who quit smoking/tobacco and those who decreased, maintained or increased their cigarette consumption. We also explored any factors associated with the changes in smoking behaviours. Results: We recruited 6,014 smokers between September 19-March 20; of these, we were able to follow-up 2,087 in the post-COVID-19 wave 2 between May-July 20. Of all participants at wave 2, 14% (290/2062) stopped smoking completely, 59% (1210/2062) reduced, 12% (239/2062) maintained and 16% (323/2062) increased the number of cigarettes smoked. Among those who were smoking at wave 1, an estimated 63% made at least one quit attempt. Moreover, the mean number of cigarettes per day dropped from 14 cigs/day to 9 cigs/day. Change in motivation to quit between wave 1 and 2 was strongly associated with quitting behaviours. Conclusions: While many people stopped, reduced or tried quitting; some increased their smoking consumption after COVID-19. Smoking cessation support, non-existent in most low- and middle-income countries, could support smokers and increase quitting success in such global events.

FUNDING: Academic Institution



PODIUM PRESENTATION 4

PAPER SESSION 12: PROMOTING CESSATION AMONG THOSE WITH PSYCHIATRIC DISORDERS: UTILIZING CREATIVE SOLUTIONS

POD12-1

INTEGRATED SMOKING CESSATION TREATMENT FOR PEOPLE WITH SERIOUS MENTAL ILLNESS: RESULTS OF A RANDOMIZED PRAGMATIC SERVICE INTERVENTION TRIAL

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Significance: The lifespan disparity due to smoking related mortality in adults with serious mental illness (SMI) approaches 30 years. Smoking cessation medications are safe and effective but underutilized in those with SMI. Few system-level interventions to improve smoking cessation treatment for those with SMI have been tested. **Methods:** We conducted a randomized, modified 2x2 factorial design trial. We tested a) the effect of offering academic detailing (AD) on evidence-based smoking cessation treatment to primary care providers, and b) community health worker (CHW) support for smoking cessation to patients. Study outcome was CO or cotinine verified abstinence at 2 years. Participants were adults with SMI who smoked and received state-contracted psychiatric rehabilitation services through the two largest providers in the state. Participants who received primary care at clinics serving >2 enrolled participants were randomized by clinic to AD or treatment as usual (TAU). Participants in clinics assigned to AD were then randomly assigned at the participant level to be offered a CHW or not. AD was not feasible in clinics serving <2 participants; these participants were randomly assigned to CHW or TAU. **Results:** Overall, 1497 adults were eligible, and 1166 enrolled; 1011 attended clinics with >2 participants, 667 attended clinics randomized to AD, and 251 of these were assigned to the CHW intervention. Of 155 participants who attended clinics with ≤ 2 participants, 78 were assigned to CHW. In preplanned mixed effects logistic regression analyses with multiple imputation, CHW support was associated with a higher CO-verified, 7-day point prevalence tobacco abstinence rate than TAU (15.3% vs. 6.6%, $p = 0.006$), and AD was not (11.6%, ns). There was no significant interaction effect of AD and CHW ($p=0.73$). A completer analysis yielded similar results, with a more than 3-fold higher 7-day point prevalence abstinence rate with CHW than TAU (16.7% vs. 5.7%, $p = 0.005$) and no significant effect of AD on abstinence. **Conclusion:** Although AD was not effective, CHW support was associated with increased rates of tobacco abstinence in adults with SMI receiving psychiatric rehabilitation services.

FUNDING: Federal

POD12-2

FEASIBILITY AND PRELIMINARY EFFICACY OF BEHAVIORAL ACTIVATION FOR SMOKING CESSATION IN VETERANS WITH PTSD

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Significance: Posttraumatic stress disorder (PTSD) is strongly associated with heavy cigarette smoking and unsuccessful quit attempts. Evidence-based smoking cessation treatment is relatively ineffective for those with PTSD, and few targeted treatments have been developed to improve their quit rates. This study evaluated the feasibility and preliminary efficacy of Behavioral Activation (BA) as an adjuvant to standard smoking cessation treatment in veterans with PTSD. **Methods:** Participants were U.S. veterans with PTSD (N=124; 12% women, 86% white) who enrolled into a randomized smoking cessation trial. Behavioral Activation + standard smoking cessation treatment (BA+ST; n=63) was compared with a comparably intense combination of health &

smoking education + standard smoking cessation treatment (HSE+ST; n=61) on 7-day point-prevalence abstinence at weeks 4, 12, 20, and 26 post-target quit date (TQD; with CO-confirmation at week 26). Indices of treatment feasibility and acceptability were also evaluated. Participants in both groups received eight 1-hour, in-person counseling sessions over 8 weeks (ending at week 4 post-TQD). All participants received 12 weeks of combination nicotine replacement therapy (patch + gum or lozenge). **Results:** Self-reported abstinence rates were similar between treatment groups throughout the treatment period (4 weeks: BA=36.5% vs. HSE=34.4%; 12 weeks: BA=31.7% vs. HSE=31.1%), but diverged during follow-up (20 weeks: BA=34.9% vs. HSE=23%; 26 weeks: BA=19% vs. HSE=13% [all p 's=ns]); CO-confirmed rates at 26 weeks: BA=17.5% vs. HSE=11.5%, [OR=1.63, $p=.35$]. Treatment participation was excellent, with >75% attending each in-person counseling session for both treatment groups. Most of those assigned to BA found the counseling "very" or "extremely" helpful (M=6.11, SD=1.15/7.0) and completed >70% of BA treatment goals (i.e., engaging in positively reinforcing, non-smoking activities). **Conclusions:** This study provides preliminary evidence that a BA adjuvant to standard smoking cessation treatment is feasible in those with PTSD and may improve their likelihood of successful quitting. Larger trials are needed to detect clinically meaningful effects.

FUNDING: Federal

POD12-3

EFFECTIVENESS OF A NOVEL SMOKING CESSATION INTERVENTION AMONG LOW-INCOME SMOKERS WITH VARYING LEVELS OF PSYCHOLOGICAL DISTRESS

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Introduction: Smoking and financial hardship disproportionately affect people with mental illness. Interventions addressing both conditions are lacking. **Methods:** We conducted secondary analysis of data from a randomized control trial (N=414) testing an intervention that integrated financial management coaching and smoking cessation coaching for low-income smokers (versus Waitlisted Control). We conducted multivariable logistic regression to estimate the relationship between baseline psychological distress level (low, moderate, or severe) using the Kessler-6 and 6-month smoking-induced deprivation and financial distress, controlling for baseline covariates. We also estimated the effectiveness of the Intervention versus Control at increasing 7-day abstinence, stratified by baseline psychological distress level. **Results:** Participants with severe baseline psychological distress were significantly more likely to report smoking-induced deprivation at 6-months compared to those with low baseline psychological distress (34% vs. 17%; aOR=2.46, 95%CI=1.14-5.31). The odds of experiencing high financial distress was significantly greater among those with severe baseline psychological distress as compared to those with low psychological distress (78% vs. 54%; aOR=1.87, 95%CI=1.04-3.35). When examining treatment group differences at 6-months, we found that people with low and moderate baseline psychological distress who were randomized to the Intervention were significantly more likely to report 7-day abstinence at 6 months compared to people with low or moderate psychological distress who were randomized to the Control group (aOR=3.39, 95% CI=1.05-11.01 and aOR=2.93, 95% CI=1.02-8.38, respectively). However, among people with severe psychological distress, there was no significant group difference on 7-day abstinence at 6 months (aOR=1.51, 95% CI =0.57-4.05). **Conclusion:** While the Intervention may have been more effective than the control group for those with low and moderate psychological distress, it was not effective for those with severe psychological distress. A smoking cessation intervention that integrates mental health may be more advantageous for this group.

FUNDING: Academic Institution; Other

**POD12-4****THE BEHAVIORAL STRATEGY OF MINI-QUITS MAY IMPROVE SMOKING CESSATION OUTCOMES FOR PERSONS WITH COMORBID SERIOUS MENTAL ILLNESS AND TOBACCO DEPENDENCE: A MIXED METHODS STUDY**

Diana Arntz¹, Kristina Schnitzer¹, Melissa C. Maravic¹, Nathaniel L. Phillips¹, Sally Reyering², Michael Fetters³, Gladys Pachas¹, Bianca Deeb², Sarah Pratt⁴, Corinne Cather¹, A. Eden Evins¹. ¹MA General Hospital, Boston, MA, USA, ²Bay Cove Human Services, Boston, MA, USA, ³University of Michigan, Ann Arbor, MI, USA, ⁴The Geisel School of Medicine at Dartmouth, Concord, NH, USA.

Significance: Reports suggest practicing small acts of self-control may improve smoking cessation success. We studied whether a “mini-quit,” or achieving the goal of brief (24-hour) tobacco abstinence would improve sustained abstinence rates with pharmacologic and behavioral therapy. **Methods:** We conducted an exploratory mixed methods analysis to evaluate whether mini-quits were associated with abstinence among participants who worked with community health workers (CHWs) in a 2-year pragmatic trial that enrolled 1166 participants and randomly assigned 366 to be offered CHW support, of whom n=220 accepted CHW support. After baseline assessment, participants completed 2 annual surveys of smoking behavior during the intervention period. Qualitative interviews conducted at the end of the trial to explore facilitators and barriers to success of the intervention were conducted with all 12 CHWs and 25 participants that were recorded, transcribed, coded and analyzed using NVivo 12. **Results:** In qualitative interviews, most CHWs and some participants reported a perceived benefit of mini-quits in smoking reduction and cessation and reported that the benefit appeared to occur through enhancing participant confidence in their ability to quit. In quantitative analyses, 23.8% of participants who worked with a CHW made mini-quits of ≥ 24 hours. Participants who achieved 7-day point prevalence abstinence at the end of the 2-year intervention, the 1st study outcome, made more mini-quits than those who were not abstinent at the end of the intervention (mean =4.43(SD=7.5) vs 2.6(SD=5.8))($\beta=0.49$ (SE=0.09), $p<0.001$). CHWs reported that participants often had a single successful 24-hour mini-quit prior to anticipated group or CHW support and increased the frequency and duration of subsequent mini-quits before quitting. **Conclusion:** Mixed methods analyses suggest successful, positively framed mini-quits are a behavioral strategy that may improve smoking cessation rates in people with SMI. Mechanisms may include opportunities to build confidence and skills, to receive positive reinforcement for goal attainment, and to experience the benefits of smoking cessation pharmacotherapy in reducing craving.

FUNDING: Federal

PAPER SESSION 13: ON THE BASIS OF SEX**POD13-1****OVARIAN HORMONES AND CONTRACEPTIVE ESTROGEN ALTER NICOTINE DEMAND INTENSITY AND ESTROGEN AND DOPAMINE RECEPTOR EXPRESSION WITHIN THE REWARD PATHWAY**

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Many women use some form of oral contraceptives while smoking, and ovarian hormones across the menstrual cycle can affect craving and smoking relapse propensity. Ethinyl estradiol (EE), a synthetic, orally bio-available estrogen, is the most common estrogen in oral contraceptives, and is currently prescribed to women chronically. The current study examined the impact of 17- β -estradiol (E2), a major form of the sex hormone estrogen, as well as EE on nicotine self-administration, demand, reinstatement, and protein expression within the nucleus accumbens core (NAcore) and ventral tegmental area (VTA) following ovariectomy (OVX) or sham surgery. OVX vehicle-treated females self-administered significantly less nicotine, had significantly lower intensity of demand, and reinstated significantly less as compared to sham vehicle-treated females. OVX E2 and EE treatment groups showed a rebound of nicotine intake later in training and Q0 levels of consumption were partially rescued in both groups. Further, E2 but not EE reversed the abolishment of reinstated nicotine seeking induced by OVX. Estrogen receptor (ER)- β protein expression was downregulated in OVX vehicle compared to sham vehicle-treated animals in both the NAcore and VTA, and this was only reversed by hormone supplementation in the NAcore. No differences in ER- α expression were found between groups. Dopamine D2 receptor expression was altered in the VTA. Taken together, these results demonstrate that ovarian hormones and EE play a critical role in mediating the neurobehavioral effects of nicotine, and future studies are needed to increase our understanding of how synthetic hormones contained within oral contraceptives interact with smoking.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD13-2**SEX DIFFERENCES IN RESPONSE TO NICOTINE DELIVERY RATE MANIPULATIONS**

Elise E. DeVito, Kevin P. Jensen, Mehmet Sofuoglu. Yale University School of Medicine, New Haven, CT, USA.

Significance: Combustible cigarettes rapidly deliver nicotine to the brain. One proposed method for reducing the addictive liability of tobacco products is to slow the rate of nicotine delivery so products provide less reinforcement while still ameliorating craving and withdrawal. Sex differences have been reported for subjective effects of nicotine, withdrawal and craving, so it is important to consider sex differences in response to nicotine delivery rate manipulations. **Methods:** Eighteen cigarette smokers (8 M, 10 F) completed 4 experimental sessions and received intravenous delivery of 1 mg nicotine per 70kg body weight in rapid (1min), medium (5min), or slow (10min) delivery rate conditions, and a saline only session. Condition order was randomized across sessions and subjects were blinded to condition order. Subjective drug effects and measures of craving and withdrawal were collected pre-infusion and at multiple timepoints up to 2hr post-infusion. This secondary analysis focused on sex-differences and analyzed all post-infusion timepoints as change scores relative to pre-infusion. **Results:** Rapid and medium nicotine delivery rates reduced smoking urges relative to saline. Females reported higher withdrawal symptoms. There were no significant sex*condition effects on smoking urges or withdrawal. There were significant sex*condition interactions for subjective effects of nicotine. Females reported rate-sensitive ‘good effects’: higher ‘good effects’ for slow and medium compared to rapid delivery, and all nicotine conditions rated higher than saline, while males did not report rate-sensitive ‘good effects’. In contrast, males reported more rate-sensitive ‘aversive effects’: rapid and medium delivery were rated as more aversive than saline in males only. **Conclusions:** While nicotine delivery significantly reduced smoking urges in both sexes to similar degrees across delivery rates, the subjective reinforcing and aversive effects of nicotine showed sex-sensitive



effects of rate of delivery. These preliminary findings suggest it is important to consider sex when considering the potential impact of nicotine delivery rate on tobacco product abuse liability.

FUNDING: Federal

POD13-3

ASSOCIATIONS OF ORAL CONTRACEPTIVE USE WITH NICOTINE DEPENDENCE IN FEMALE SMOKERS

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Significance: Recent work has shown that ovarian hormones influence smoking behavior. While more work is needed to better understand the role of hormonal functioning in this context, advancements in neuroendocrinological addiction science may help clinicians create person-specific interventions for smokers, including females who take oral contraceptives. Prior work suggests the use of oral contraceptives significantly increases the rate of nicotine metabolism in women; however, whether oral contraceptive use is implicated in nicotine dependence remains unclear. The present study investigated whether nicotine dependence differed among females who reported current use of oral contraceptives vs. females who did not. **Methods:** Respondents completed questionnaires measuring cigarette and other nicotine/tobacco product use in an online survey. Two subgroups were established: female smokers who reported current oral contraceptive use ($N = 27$; M age = 26.9) and female smokers who did not report oral contraceptive use ($N = 60$; M age = 29.0). Nicotine dependence was assessed via the Fagerstrom Test for Cigarette Dependence and compared between subgroups. **Results:** Nicotine dependence scores were lower among oral contraceptive users compared to non-users ($F(1, 84) = 4.00, p < 0.05$). This association remained marginally significant when controlling for age and smoking rate ($F(1, 81) = 3.50, p = .07$). **Conclusions:** Use of oral contraceptives was associated with lower rates of nicotine dependence. With additional validation, these data could inform pharmacological intervention strategies considerate of female-specific hormonal dynamics.

FUNDING: Federal

POD13-4

COMT GENOTYPE MODULATES THE EFFECTS OF A COMT INHIBITOR MEDICATION ON SMOKING URGES IN FEMALES

Elise E. DeVito, Mehmet Sofuoglu. Yale University School of Medicine, New Haven, CT, USA.

Significance: Sex-sensitive effects of catechol-O-methyltransferase (*COMT*) genotype in smokers have been demonstrated: the genotype coding for lower *COMT* enzyme activity was associated with diminished smoking urges after overnight abstinence in females, but not in males. *COMT* enzyme function can also be inhibited pharmacologically with the medication tolcapone. **Methods:** Non-treatment-seeking females who smoke cigarettes were randomized to eight days of tolcapone (100mg*three times a day) or placebo, in a double-blind parallel-group design. Participants were told to smoke *ad libitum* prior to the baseline assessment and during the first 5 days of the medication phase, and were asked to abstain from smoking (and were provided with additional payments to reinforce abstinence) for the final 2 1/2 days of the medication trial. Self-reported smoking urges were collected at the beginning and end of trial; and a laboratory measure of smoking behavior was collected at the end of the trial. *COMT* genotype (Val158Met, rs4680) was collected to assess whether tolcapone effects were moderated by *COMT* genotype. **Results:** A treatment group by genotype interaction reflected larger treatment effects (greater reductions in smoking urges in tolcapone relative to placebo) within smokers with the Val/Val genotype (i.e., higher *COMT* enzyme activity genotype). The tolcapone group had better outcomes than the placebo group on a laboratory Smoking Choice Paradigm (i.e., chose more tokens over cigarette puffs), and this effect was not moderated by genotype. **Conclusions:** Within a female-only sample, the *COMT* inhibitor medication, tolcapone, reduced smoking urges and laboratory smoking behavior. While the medication effect on smoking urges was more pronounced in those who have a genotype coding for higher *COMT* enzyme activity, laboratory smoking outcomes were not significantly modulated by genotype. These findings provide preliminary support for pharmacological inhibition of *COMT* enzyme activity as a novel treatment in females who smoke cigarettes.

FUNDING: Federal

PAPER SESSION 14: ALTERNATIVES TO SWITCHING: BUILDING A FOUNDATION FOR ENDS CESSATION

POD14-1

A BEHAVIORAL SMOKING CESSATION INTERVENTION FOR QUITLINE CALLERS WHO ALSO USE E-CIGARETTES

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SIGNIFICANCE: There are no published reports of behavioral interventions tailored for dual users of cigarettes and vapes. Approximately 56,000 dual users call state tobacco quitlines for help quitting smoking each year. **METHODS:** A novel enhanced e-cigarette coaching (EEC) intervention for individuals who both smoked and vaped at Oklahoma Tobacco Quitline enrollment was compared to standard quitline treatment (control) in a randomized pilot trial ($N=96$). Both groups received 5 coaching calls and nicotine replacement therapy (NRT). EEC treatment used a shared decision-making model for quit plan development and included vaping education, behavioral support, and two quit guides for vapers. The EEC treatment goal was smoking abstinence; quitting vaping was not a primary target. Treatment engagement and acceptability were primary outcomes in this feasibility pilot. Self-reported smoking abstinence at 3-months was examined as an underpowered secondary outcome. **RESULTS:** Participants were 40.6 years old on average ($SD=13.5$), 61% female, 60% white, 48% daily vapers (vs. nondaily), 85% daily smokers (vs. nondaily), and smoked 19.2 cigarettes per day on average ($SD=11.3$). EEC evidenced similar or better call completion ($M=3.4, SD=1.7$, vs. control: $M=2.7, SD=1.4$). Nearly all requested and were sent NRT (EEC: 100%; control: 94%). 69% (66/96) responded to the 3-month survey (EEC: 70%; control: 68%). Among respondents, 94% (30/32) of EEC and 74% (25/34) of control reported being "very satisfied" or "satisfied" with treatment ($p=0.03$). Respondent 7-day point prevalence smoking abstinence rates were 59% (19/32) for EEC and 41% for control (14/34), ($p=0.14$). With missing data imputed as smoking, abstinence rates were 41% (19/46) for EEC and 28% (14/50) for control, ($p=0.17$). **CONCLUSION:** This pilot of a tailored intervention for smokers and vapers was acceptable and feasible, and it evidenced promising engagement and smoking cessation rates. Findings indicate support for a fully powered randomized controlled trial to test the intervention.

FUNDING: Federal

POD14-2

EFFECTS OF SHORT-TERM NICOTINE DEPRIVATION ON DELAY DISCOUNTING AMONG YOUNG E-CIGARETTE USERS

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Background: Earlier delay discounting (DD) studies have demonstrated that cigarette smokers deprived of nicotine show greater discounting of delayed rewards (i. e., greater impulsivity) than when they are allowed to smoke (i. e., sated). Prior studies have explored DD rates among e-cigarette users when sated. However, no study has systematically assessed the impact of nicotine deprivation on DD rates among young e-cigarette users. This study aimed at exploring whether acute nicotine abstinence affects choices of two commodities (money and e-liquid) among e-cigarette users. **Methods:** Thirty-one young exclusive e-cigarette users (76% male; 19.1 years old) participated in three laboratory sessions (baseline, and sessions 1 and 2). At each session, they completed two DD tasks: one task assessed choices between various amounts of money (M vs M) and the other assessed choices between e-liquid now vs. money later (mL-M). Nicotine abstinence (12 h) was verified using levels of breath carbon monoxide and urinary cotinine. **Results:** Repeated measures ANOVA revealed a significant effect of time for the M-M task, indicating significant changes over time in DD rates for money ($p < .001$). Post hoc analyses showed that AUC scores were larger at sessions 1 and 2 compared to the baseline ($ps < .05$). Analyses also revealed a significant effect of time for the mL-M ($p < .001$). Post hoc analyses showed that AUC scores were lower at session 1 ($p < .05$) compared to the baseline. **Discussion:** Acute nicotine abstinence increased the preference for small amounts of nicotine (i.e., e-liquid) delivered immediately over alternative reinforcers (i.e., money) that are available after a delay, but decreased



impulsive choices for immediate monetary rewards over larger, more delayed amounts of money. Our results suggest that young e-cigarette users in nicotine withdrawal may engage in more impulsive behaviors when that behavior is related to vaping. Our results have important implications for e-cigarette cessation programs. Abstinence-based contingent management programs could be a good approach for e-cigarette cessation only if providing large rewards for immediate e-cigarette abstinence.

FUNDING: Federal

POD14-3

SMOKING CESSATION OUTCOMES AND FACTORS ASSOCIATED WITH CONTINUED VERSUS DISCONTINUED USE OF E-CIGARETTES: A SAMPLE OF TREATMENT-SEEKING SMOKERS

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Background: Recent reports suggest that many people who use e-cigarettes (ECs) want to quit using them, but are unable to do so. Little is known about what fraction of people quit using ECs, factors associated with quitting ECs, and whether quitting ECs is related to quitting combustible cigarettes. Thus, in a sample of treatment-seeking smokers who used ECs, we compared those who did versus did not quit using ECs on baseline and treatment-related variables, as well as abstinence from combustible cigarettes. **Methods:** Participants were a subset of smokers enrolled in a RCT of two web-based smoking interventions who reported EC use at baseline, 3-, and/or 6-months (N=1345). Participants were classified based on whether or not they quit using ECs at 12-months. Participant characteristics were assessed at baseline; treatment variables (e.g., using FDA-approved cessation medications) were assessed at 3- and 6-months; cessation of ECs and combustible cigarettes was self-reported at 12-months. **Results:** Relative to EC users who did not quit using ECs by 12months (47%; n=631), those who did quit using ECs (53%; n=714) were younger (45.6 years vs 47.5 years; p=0.007), more likely to identify as a racial minority (29% vs 23%, p=0.039), and had lower nicotine dependence (p=0.003) at baseline. Those who quit ECs by 12-months were less likely to ever report daily EC use (42% vs 62%; p<0.001) or ever use ECs as a cessation aid (32% vs 57%; p<0.001). Groups were similar on other baseline characteristics and in their reported use of FDA-approved medications. Finally, those who quit using ECs were more likely to achieve 30-day self-reported abstinence from combustible cigarettes at 12 months (OR=2.07; CI=1.59, 2.70; p<0.001). **Conclusions:** Smokers who quit using ECs by 12 months were twice as likely to also quit smoking combustible cigarettes relative to those who continued EC use. Several user characteristics are associated with continued EC use; EC users with these characteristics may benefit from additional support to increase their odds of quitting both ECs and combustible cigarettes.

FUNDING: Federal

POD14-4

HOW AND WHY DO DUAL USERS QUIT ELECTRONIC CIGARETTES? FINDINGS FROM A SURVEY OF ADULTS WHO USE ELECTRONIC AND COMBUSTIBLE CIGARETTES

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Significance: Most people who use electronic cigarettes (EC) also smoke combustible cigarettes (CC). Discontinuation of ECs among CC smokers who tried using ECs and found them unsatisfying is common. Less is known regarding dual users' motivations or methods to quit (i.e., a volitional act to stop using) ECs or how this relates to quitting CCs. **Methods:** We used Amazon Mechanical Turk, a web-based crowd-sourcing service, to survey 366 US adults with a history of regular EC and CC use. This analysis examined motivations and methods to quit both products among a subset of 204 (55.7%) respondents with dual use and a history of ≥1 attempt to quit ECs. **Results:** Most respondents (95%) were using ECs at the time of this survey and had a lifetime median of five quit attempts. Respondents endorsed a median of two motivations and two methods for quitting ECs. The most common motivations were health (74%), money/cost (44%), to reduce risk of COVID-19 (25%), increased use of other tobacco (20%), and to perform better at work or school (19%). The most common methods were cutting down to quit (68%), quitting cold turkey (28%), getting advice from a doctor (24%), using nicotine replacement therapy (24%), and switching to ECs with less nicotine (24%). Most reasons and strategies to quit ECs and CCs were moderately to highly correlated, suggesting a similarity in dual users' views on quitting the two products. **Conclusions:** Dual users endorsed a range of motivations and methods to quit ECs, most of which were similar to motivations and methods to quit CCs. Our findings could, in part, reflect the growing misperception that ECs are as or more harmful than CCs or the lack of evidence on how

quitting ECs affects CC smoking among adults with a history of dual use. Importantly, the effects of EC cessation on CC smoking could be influenced by how (eg, quitting ECs with or without treatment) and when (eg, quitting ECs before, during, or after quitting CCs) dual users quit. There is a need for experimental research to assess the effects of quitting ECs and to inform treatment for dual users who are motivated to quit ECs.

FUNDING: Federal

POD14-5

UNDERSTANDING CONTEXTS OF SMOKING VERSUS VAPING AMONG DUAL USERS - ANALYSIS OF ECOLOGICAL MOMENTARY ASSESSMENT DATA

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Significance: E-cigarettes are highly disruptive products whose effects researchers, clinicians, consumers, and public health experts are striving to understand. Little is known about the contexts in which dual users of combustible and e-cigarettes use the two products. **Methods:** Adult dual users (N=162, 49% female, 73% white) with no plans to quit smoking or vaping in the next 30 days, and who used nicotine-containing e-cigarettes at least once a week for the past month and smoked daily for the last 3 months, were recruited for a longitudinal observational trial. Participants carried smartphones for 2 weeks at baseline to record each use event for the two products and report the external context (e.g., is smoking allowed) and internal context (e.g., craving, expectancies, affect) of a random sample of use events. We used multi-level generalized linear models to examine both the within- and between-subject effects of context on the likelihood of vaping (vs. smoking). **Results:** Participants reported a mean of 7.3 (SD=5.7) smoking events and 4.4 (SD=8.4) vaping events each day. The hierarchical linear modeling results show that when smoking is not allowed in a context, dual users are more likely to vape than smoke but this effect was most reliable for dual users who always choose to smoke first in the morning rather than vape (i.e., the least dependent on e-cigarettes). Reports of strong cravings to smoke and positive expectancies for cigarettes were associated with reduced likelihood of vaping whereas strong cravings to vape and positive vaping expectancies were related to increased likelihood of vaping. There were no differences in the amount of time spent smoking or vaping or the number of puffs taken during vaping or smoking events based on e-cigarette dependence (i.e., frequency of vaping first thing in the morning). **Conclusion:** Both internal and external context features influenced whether dual users chose to smoke or vape. Interestingly, the influence of some context factors varied based on the level of e-cigarette dependence. These findings suggest the importance of examining the interaction of person and context factors on dependence and continued use.

FUNDING: Federal



PODIUM PRESENTATION 5

PAPER SESSION 21: MULTI-SYSTEM
IMPACT OF NICOTINE EXPOSURE: COVID
AND BEYOND

POD21-1

IS THERE A LINK BETWEEN E-CIGARETTE USE AND COVID-19?

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Significance: The COVID-19 pandemic has presented a challenge worldwide lately. There is urgent need to learn about the pathology and the individual differences in outcomes. Patient reports have suggested a possible correlation between smoking and severe respiratory symptoms following infection. It has been demonstrated that ACE2 in the lungs serve for viral entry. Here we investigate whether e-cigarette vapor exposure alters the expression of ACE2 and related proteins in male and female mice. **Methods:** Male and female C57BL6/J mice were exposed to e-cigarette nicotine (7.5 mg/ml) or vehicle vapor across five sessions. On the final day, tissue were collected and RT-qPCR analysis was conducted to determine the levels of ACE2 and its associated protein Tmprss2 in lung tissue. We also examined for differences of alpha5 and alpha7 receptor subunits, that have been associated with cancer and inflammation. To assess if ACE2 protein is released into the blood after the treatment, blood plasma samples were analyzed with an ELISA assay. To determine if the differences were specifically due to nicotine, a group of mice were subcutaneously injected with saline or nicotine daily for five consecutive days. On the final day, mice were sacrificed and lung tissue was collected and processed for ACE2 expression. **Results:** We found a significant increase in ACE2 mRNA in lung tissue of male mice exposed to nicotine-containing vape, as compared to the vehicle control. This difference was sex-specific, as the female groups did not differ in ACE2 mRNA expression. No differences were found between the experimental groups for Tmprss2, alpha5 or for alpha7. Similarly, protein quantification of ACE2 in the blood did not detect any change following vapor exposure. In the second study, no significant differences were observed between groups following peripheral nicotine treatment, indicating that inhalation of nicotine with the vehicle mitigated the increase in ACE2 expression. **Conclusion:** The data derived from these preliminary investigations highlights a putative direct link between e-cigarette vapor and increased ACE2 expression in the lungs of males. Future studies will be necessary to determine whether these nicotine vapor-mediated effects subsequently lead to altered pathology and lung function following viral COVID-19 infection, which may thus inform on individual differences found in patient populations. *Supported by the National Institute on Drug Abuse (DA039658 to CDF) and Tobacco-Related Disease Research Program (T30FT0967 to VL).*

FUNDING: Federal; Nonprofit grant funding entity

POD21-2

ROLE OF SMOKE ON ACE-2 MEMBRANE PROTEIN EXPRESSION
IN BRONCHIAL EPITHELIAL CELLS

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Significance: Nicotine use and smoking status may have an impact on COVID-19 infection rates, hospitalizations, disease severity and mortality. As for the possible molecular mechanisms underlying the potential association between smoking and viral infection several reports focused their attention on the possible modulatory effect of smoking on ACE-2 protein expression which has been proved to serve as possible receptor for virus entry into epithelial cells. The aim of the present proposal was to evaluate the effect of smoke from cigarettes on ACE-2 in bronchial epithelial cells as a possible risk for sars-Cov2 infection. **Methods:** Normal bronchial epithelial cells (H292) were exposed to smoke by an air liquid interface (ALI) system for 6h, 24h and 48h. Nicotine dosimetry was performed at all exposures time points. Furthermore, we evaluated ACE-2 membrane protein expression by Operetta following cell segmentation with Harmony software. Finally, we also selected microarray dataset of airways epithelial cells to unravel the possible molecular mechanisms underlying ACE-2 regulation. **Results:** Our data showed a significant selective reduction of membrane ACE-2 expression (about 25%)

following smoking exposure. Interestingly, we observed a positive direct correlation between ACE-2 reduction and nicotine delivery. Furthermore, by stratifying GSE52237 as a function of ACE-2 gene expression levels, we highlighted 1012 genes related to ACE-2 in smokers and 855 in non-smokers. In order to verify a possible relationship between the genes co-expressed with ACE-2 and the genes involved during the endocytosis process, we performed a Venn diagram analysis. 161 genes involved in the endocytosis process were highlighted using the online pathway tool KEGG. The result showed that 11 genes were in common between the ACE-2 pathways in smokers and the genes regulated during endocytosis, while 12 genes with non-smokers. Among these genes, six in non-smokers and four genes in smokers were closely involved during the viral internalization process. **Conclusions:** Our data may offer a pharmaceutical role of nicotine as potential treatment option in COVID-19.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD21-3

EXPOSURE TO E-CIGARETTE AEROSOL EXTRACTS ALTERS
THE EXPRESSION OF CYTOCHROME P450 MONO-OXYGENASE
ENZYMES

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Background and Aim: E-cigarette aerosols contain fewer chemicals than tobacco smoke and, thus, have been promoted as a smoking cessation tool and a safer alternative to conventional tobacco. Hence, the use of e-cigarettes has skyrocketed. More than 5.3 million American high and middle school students reported using e-cigs in 2019. Among adults, most e-cigarette users are either current smokers (dual users) or past smokers. Current smokers have the highest rate of use, with 52.5% reporting to have ever used an e-cigarette and 10.8% currently using e-cigarettes. Cytochrome P450 (CYP) monooxygenases are intracellular enzymes that play a key role in the bio-activation of tobacco smoke procarcinogens such as benzo[a]pyrene into reactive metabolites that are carcinogenic. Here, we examined the effects of e-cigarette aerosol extracts exposure on the expression of CYP enzymes in oral epithelial cells. **Methods:** E-cigarette aerosol extracts were prepared from two brands of e-cigarettes, as previously described. Mainstream tobacco smoke extract was used as a positive control. Epithelial oral cancer and non-cancer cell lines were exposed for 48 h to e-cigarette aerosol extracts at nicotine doses comparable to those observed in e-cigarette users. Whole-cell RNA and protein were isolated. Gene and protein expression were assessed by RNA-sequencing and western blotting. Data were analyzed by Student's t-tests and ANOVA models. **Results:** We observed that exposure of oral cells to e-cigarette aerosols increased the mRNA and protein expression levels of key CYP enzymes involved in the metabolism of polycyclic aromatic hydrocarbons into carcinogenic intermediates. The levels of CYP enzymes in cells exposed to e-cigarette aerosol extracts were in general lower or comparable to levels observed in tobacco smoke-exposed cells. **Conclusions:** Our study suggests that exposure to e-cigarette aerosol can induce the expression of CYP enzymes, thus allowing the cells to activate potentially harmful chemicals. These findings are particularly important in the context of dual e-cigarette and conventional tobacco users and pave the way towards further studies on the health effects of e-cigarettes.

FUNDING: Federal; State; Nonprofit grant funding entity

POD21-4

DYSBIOSIS OF THE ORAL MICROBIOTA IS SPECIFIC TO
TOBACCO PRODUCT USED

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The human oral microbiota is home to a complex microbial ecosystem, which is closely linked to the physiological state of the body. Specifically, these bacterial communities are associated with changes in the immune system which can lead to substantial shifts in the symbiotic balance between host and microbiota. Tobacco use adversely affects every organ of the human body. However, much less is known about its impact on temporal changes in the oral microbiota and the bacterial community shifts triggered by use of different tobacco products. To address this knowledge gap, we conducted a

**PAPER SESSION 22: NOVEL APPROACHES TO DESIGNING AND EVALUATING SMOKING CESSATION INTERVENTIONS****POD22-1****CO-DESIGN OF AN SMS TEXT MESSAGE SUPPORT PROGRAMME FOR SMOKERS TO USE E-CIGARETTES TO QUIT SMOKING**

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Significance: E-cigarettes (EC) are commonly used by smokers in quit attempts with increasing evidence of efficacy for smoking cessation. Nevertheless, many smokers require extra support to fully transition to vaping. Text messages have been used successfully to increase abstinence rates but no messages exist specifically about vaping. We worked with people who vape or smoke to co-develop a bank of text messages designed to support smokers to quit smoking through EC use. **Methods:** Following a Twitter call to vapers in January 2019, 102 text messages were proposed (N=49 vapers) then refined and consolidated by smoking cessation and behaviour change experts (irrelevant and inappropriate content/words removed). Further messages were generated by experts, then grouped into seven key themes and mapped against COM-B behaviour change constructs resulting in a list of 97 messages. In an online survey, all messages, alongside 49 generic smoking cessation text messages taken from the iQuit in Practice Study, were presented to 376 smokers, ex-smokers and vapers (Sept. 2019). Each participant rated up to 20 messages (randomly presented from each theme) on 7-point Likert scales for how clear, understandable, believable and helpful they considered the message; whether they would be happy to receive the message; and how it made them feel (positive, offended, enthusiastic, interested). **Results:** All messages received a mean score above the neutral anchor of 4 on all constructs except one which scored low on 'enthusiastic' and 'interested'. This was removed along with a further 19 messages following feedback from participants. The final 76 messages were then reviewed by two experienced vapers and some further changes to wording/terminology were made to ensure consistency. Finally, together with two further vapers, LD and SC matched the messages to early, mid or late stages of quitting/vaping, ensuring adequate temporal representation from each theme. **Conclusion:** a co-design process led to the development of an acceptable bank of text messages to support smokers to quit using an EC. The final set of 76 messages are available for other researchers to use in EC smoking cessation studies.

FUNDING: Nonprofit grant funding entity

POD22-2**COCHRANE NETWORK META-ANALYSIS OF 312 TRIALS TO DETERMINE WHAT WORKS IN BEHAVIOURAL TREATMENT FOR SMOKING CESSATION**

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Significance: Behavioural treatment varies in its components and in its effectiveness. We set out to examine whether behavioural content, motivational aspects, therapist profession, and/or delivery mode influence the effectiveness of smoking cessation treatment. **Methods:** We identified randomized trials (RCTs) of behavioural interventions for smoking cessation in July 2020. We synthesised data using Bayesian component network meta-analysis, to examine whether our key characteristics influenced the effectiveness of behavioural support and whether they were modified by the population characteristics, pharmacotherapy, and intervention intensity. **Results:** We included 312 RCTs (250,563 participants) in our network meta-analysis. High certainty evidence of benefit was found for the following intervention components: counselling; guaranteed financial incentives; and an intervention focus on 'how to quit'. The remaining intervention components had moderate to very low certainty evidence, with the main issues being imprecision and risk of bias. There was no data to suggest an increase in harms in groups receiving behavioural support for smoking cessation; data here could not be meta-analysed. There was no data to suggest that population characteristics influenced component effectiveness, but information on these was often not well-reported, and

comprehensive comparison of temporal changes in the oral microbiota between tobacco users and controls. Buccal swabs and saliva samples were collected from 85 healthy participants (24 cigarette users (CG), 18 smokeless tobacco users (ST) and 43 non-users (NU)), once a month for four months. Samples (n=611) were DNA extracted and the oral microbiota was characterized by PCR amplification of the V3V4 hypervariable region of the 16S rRNA gene followed by sequencing using Illumina MiSeq. The Shannon diversity index was significantly ($p<0.05$) lower in the NU group compared to the CG and ST groups, and in the buccal swabs compared to saliva samples when comparing across all user groups. Beta diversity metrics were statistically significantly different ($p<0.05$) between the three groups and between sample types. The oral microbiota showed constant diversity over time ($p>0.05$). In comparison to the NU group, a significantly higher relative abundance ($p<0.05$) of *Rothia* spp., *Haemophilus* spp., and *Fusobacterium* spp. was found within the CG group, and a significantly higher relative abundance ($p<0.05$) of *Actinomyces* spp. was found in the ST group. Overall, these results provide a more holistic understanding of bacterial community structure in the oral cavity, suggest that tobacco use contributes to oral dysbiosis, and demonstrates how the oral microbiota might be impacted by differing tobacco products.

FUNDING: Federal

POD21-5**PRENATAL EXPOSURE TO WATERPIPE SMOKE INCREASES THE RISK OF THROMBOTIC EVENTS VIA ENHANCING PLATELET REACTIVITY**

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Background: While the rate of smoking has been declining, that of other forms of tobacco, including waterpipe/hookah continues to rise. Whilst waterpipes are perceived to be safe, including amongst women of childbearing age, we previously shown that exposure to waterpipe smoke (WPS) can produce detrimental cardiovascular health effects, including thrombotic events. However, whether prenatal (*in utero*) WPS exposure produces similar negative health effects remains to be determined. **Methods:** By employing a whole-body exposure protocol, female mice were exposed to WPS starting at one week before mating and throughout a complete cycle of gestation. The exposure was as per the Beirut protocol: one-hour session of 171 puffs, 2.6 sec puff duration, and 17 sec inter-puff interval. As for the control mice, they were matched in age and exposed to clean air only. The offspring male mice were then subjected to host of *in vitro* and *in vivo* analysis, such as the tail bleeding and the FeCl₃-induced carotid artery injury model, to assess WPS impact on hemostasis and the risk of thrombosis, respectively. **Results:** Our data show that prenatal WPS exposure enhances physiological hemostasis and increases the risk of thrombosis in the offspring of the exposed mice, in comparison to control as documented by the shortened bleeding and occlusion times. Our data also shows enhanced agonist-induced (e.g., ADP & thrombin) aggregation, dense and alpha granules secretion, as well as integrin activation, and phosphatidylserine exposure. Consistent with these findings, we also obtained biochemical evidence of enhanced platelet reactivity, namely increased activation/phosphorylation of ERK. Finally, and while still preliminary, our data revealed no difference in the weight of WPS mice as opposed to controls, at least under our experimental conditions. **Conclusion:** Our results demonstrate, for the first time, that prenatal exposure to WPS results in a prothrombotic phenotype, as evident by altered hemostasis and an increased risk of thrombosis. Moreover, this phenotype is attributed, at least in part, due to a potentiated state of platelet reactivity, including aggregation, secretion and integrin activation, which was also verified biochemically. These data clearly demonstrate that waterpipes are not safe or as safe as they are presently thought to be, including in pregnancy. Additionally, our findings are expected to increase awareness of the negative health consequences of waterpipes/hookah and guide policy for regulating their use and/or exposure to them.

FUNDING: Federal; Academic Institution



where it was, these data tended to be homogenous. Increasing intensity of behavioural support, as measured through the number of contacts, the duration of each contact, and programme length, was associated with modestly increased effect estimates, though credibility intervals included no difference. Behavioural component effects all appeared weaker in studies where all participants were given stop-smoking pharmacotherapy. **Conclusions:** Behavioural support for smoking cessation varies programme to programme; this method presents an opportunity to evaluate the effects of individual components of support to determine how to deliver a programme with the maximum chance of success. There is strong evidence that behavioural interventions increase abstinence if they offer counselling and/or guaranteed financial incentives, and focus on how to quit smoking (compared with why quitting would benefit).

FUNDING: Federal

at six months. **Results:** Most enrolled families completed the trial (97.8%, 136/139). LHN decreased in both the IG (Baseline:-1.78±1.91, Follow-up:-2.82±1.87, p=.003) and RCG (Baseline:-1.79±1.54, Follow-up:-2.85±1.73, p=.002), but did not differ between groups at study end (p=.635). Three of five parentally-reported outcomes showed improvement over time in the IG, and one in the RCG. Among IG participants, 90% found hair nicotine feedback useful. **Conclusions:** Project Zero Exposure is a feasible, acceptable program. Child TSE decreased during the trial in intervention and control groups. The lack of proven advantage to intervention over control group participants was likely due to concurrent control group improvements. Hair nicotine measurement may have contributed to decreasing exposure, and warrants further investigation as a means of reducing child TSE.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD22-3

BABYBREATHE TRIAL - PROTOCOL FOR A RANDOMISED CONTROLLED TRIAL OF A COMPLEX INTERVENTION TO PREVENT RETURN TO SMOKING POSTPARTUM

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Background: 22% of UK women report smoking in the year before pregnancy. Around half quit smoking during pregnancy, but up to 75% return to smoking within 6 months. There is no routine support to prevent relapse. 'BabyBreathe', successfully developed by our team, is a complex intervention offering a combination of one-to-one, digital and tailored pharmacological support to postpartum women. Sustained smoking abstinence has significant health benefits for mothers, minimising long-term smoking harm and risk of developing multiple cancers directly linked to continued tobacco smoking. Furthermore, maternal smoking is the primary source of infant/child second-hand smoke exposure and a substantial cause of child morbidity and mortality. **Research question:** In women who quit smoking for or during pregnancy, is the BabyBreathe intervention effective and cost-effective, in comparison with usual care, at reducing return to smoking in real world settings at long-term (12 month) postpartum follow-up? **Methods:** Multi-centre randomised controlled trial (RCT). The trial will recruit pregnant women who quit smoking for or during pregnancy across England and Scotland, with an internal pilot, health economic evaluation and process evaluation. The BabyBreathe intervention includes one-to-one support with a health visitor, text and app based electronic support, and the 'BabyBreathe box', a gift sent to women at time of delivery, including NRT gum for lapse prevention. **Timelines:** Recruitment start January 2021. Total duration 39 months. **Anticipated impact and dissemination:** We will definitively test BabyBreathe and make recommendations for future implementation. Our health economics study will ascertain cost effectiveness, and data may be used to model long term health benefits. Our in-built process evaluation will explore which components of the intervention are particularly effective for which sub-groups in particular contexts. If the BabyBreathe intervention can be demonstrated to improve sustained smoking abstinence rates in postpartum women, and is cost effective, the intervention will be made freely available in the UK across the NHS, integrated with routine postpartum care.

FUNDING: State

POD22-4

PROTECTING CHILDREN FROM TOBACCO SMOKE EXPOSURE - A RANDOMIZED CONTROLLED TRIAL

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Significance: Young children are vulnerable to harm from tobacco smoke exposure (TSE). This study assessed the effect of Project Zero Exposure - an intervention program designed to help parents protect children from TSE - on children's hair nicotine and parentally-reported outcomes. **Methods:** Design: Randomized controlled trial Setting: Home-based intervention Participants: Parents of young children (< 8 years) in families with a smoking parent were eligible. Intervention: Families were randomized to two main groups, intervention (IG, N=69 families) and regular control (RCG, N=70 families). The intervention included objective feedback on child exposure (hair nicotine), and home air quality (PM_{2.5}), and used motivational interviewing. Measurements: We report on log hair nicotine (LHN) and parentally-reported child TSE measures in the IG versus RCG

**PAPER SESSION 23: UNDERSTANDING AND TREATING INEQUALITIES IN SMOKING****POD23-1****AN INTEGRATED METHOD TO PRESENT TRENDS IN HEALTH INEQUALITIES AND APPLICATION TO 2003-2015 TRENDS IN SOCIOECONOMIC INEQUALITIES IN ADOLESCENT SMOKING IN EUROPE**

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Significance: Appropriate and unambiguous measurements of health inequality trends are needed for monitoring and policy evaluation purposes. This study aimed to develop and apply a method to present and interpret trends in health inequalities, without distinguishing absolute and relative inequalities. **Methods:** We used repeated cross-sectional data on smoking behaviour of 165,630 15 and 16-year-old adolescents from 22 countries, from the 2003, 2007, 2011 and 2015 European Survey Project on Alcohol and Other Drugs surveys. Multilevel logistic regression models estimated weekly smoking prevalence adolescents at the lowest (P(0)) and highest (P(1)) ends of socioeconomic status (SES). Using simulation methods, 95% confidence regions were constructed for plotted points of (P(1),P(0)) and a linear regression line fitting these points. The intercept of the regression line indicated the predicted low SES smoking prevalence if high SES prevalence were 0%, and the slope indicated smoking decrease in low SES compared to high SES. The likelihood of eradication of smoking was calculated as the percentage of simulated regression lines predicting under 5% prevalence in both high and low SES. Analyses were stratified by gender and European region. **Results:** Smoking prevalence was 21.6% among boys and 21.0% among girls. We presented a graphical presentation of plotted (P(1),P(0)) values, their confidence regions, and regression line. Smoking prevalence decreased more slowly among low SES than high SES adolescents. Prevalence in boys was predicted to remain at 8.6% (4.6;12.9) for low SES when 0% for high SES, and 5.0% (0.2;9.7) in girls. Likelihood of eradication was 4% among boys and 46% among girls. Trends seem more favourable in North and West than in South and East Europe. **Conclusion:** Our method visualised and quantified trends in inequalities, allowing to conclude that the current trend will unlikely lead to smoking eradication among boys in Europe. Assumption of linearity and the need for a steady decline in the outcome are limitations of this method that may require further development.

FUNDING: Unfunded

POD23-2**SECOND HAND SMOKE EXPOSURE DURING PREGNANCY, QUALITATIVE INTERVIEWS WITH ISRAELI PREGNANT WOMEN WHO HAVE A PARTNER THAT SMOKES**

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Background Second-hand smoke [SHS] exposure during pregnancy is associated with low birth weight, stillbirth, preterm delivery, congenital malformations, and delayed neonatal neurodevelopment. Rates of SHS exposure at home are high in Israel, reported by 24% of non-smoking Jewish women, and 61.3% of Arab women. Reducing SHS exposure during pregnancy could have a significant impact on both maternal and infant morbidity and mortality, contributing also to reduced health inequalities. The aim of this study was to explore in-depth the experiences of pregnant women regarding their exposure to SHS, specifically from their partner. **Methods** Qualitative semi-structured interviews were conducted with women who are currently pregnant or have recently given birth and have a partner who smokes. Women could be smokers, ex-smokers or never smokers. Participants were recruited through promoted social media advertisements. Women were offered 50 NIS as reimbursement for their time. Interviews were audio-recorded and transcribed. A general thematic approach guided the analysis. **Results** 39

semi-structured interviews were conducted: 34 in Jewish participants, and 5 in Arab participants. Overall, 15 were never smokers, 24 ex-smokers, and 5 current smokers. Preliminary results indicate that general knowledge regarding SHS being harmful was high; However, most participants described low levels of knowledge on the specific harms of SHS in pregnancy. The cigarette smoke smell was perceived as intrusive; and a strong motivator for behaviour change. Inability to confront partner, or other household members, was also prominent, with women reporting using personal means of trying to reduce exposure (such as covering their face or moving away). Specifically, among the Arab participants, a strong need for public awareness campaigns was expressed. **Discussion.** Participating women reported lack of knowledge about SHS specific harms, with mixed feelings about their right for clean air. Findings from this study, and a similar study among pregnant women's partners, will inform the development of a culturally tailored behavioural intervention focusing on reducing SHS exposure during pregnancy.

FUNDING: Unfunded

POD23-3**THE SMOKE-FREE TOGETHER APP - FOLLOW-UP OF A mHEALTH PREGNANCY SMOKING CESSATION INTERVENTION IN ROMANIA**

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Significance: Behavioral interventions for smoking cessation during pregnancy have been proven effective but are costly and difficult to scale. Delivery via mobile technology has the potential to increase accessibility. This research reports preliminary findings on the efficacy of the Smoke-Free Together (SFT) randomized controlled trial (RCT) in Romania, a smoking cessation intervention for couples during and after pregnancy. **Methods:** The SFT RCT enrolled 74 pregnant couples in 2019-2020 to receive: the SFT app (N=19), phone counseling sessions (N=19), the app and counseling sessions (N=18) and usual care as a control (N=18). The intervention ended at 1 month postpartum and 69 women were followed-up to date, including self-report and biochemical verification. **Results:** The mean app use duration in the two app-user groups was 102 days (SD=71,1), and 82% of pregnant smokers installed and used the SFT app at an average rate of close to 13 sessions/user. In the two groups benefiting from counseling, between 0-3 sessions/participant were delivered, averaging 0.94 sessions per pregnant smoker. The follow-up rate was 83%. Self-reported quit rates (3-month postpartum) were 64,3% in the app-only group, 56,3% in the counseling-only group, and 50% in the app and counseling group, versus 33,3% in the control group. Biochemical validation of non-smoker status was achieved in 83% of tests in the app group, 33% in the counseling group, 20% in app and counseling, 25% in the control group). **Conclusion:** Preliminary findings support SFT as a potentially efficacious mHealth pregnancy smoking cessation intervention.

FUNDING: Federal

POD23-4**“THE ONLY REAL SMOKE” AND ALTERNATIVE NICOTINE PRODUCTS: HOW DO REAL WORLD SMOKERS PERCEIVE TOBACCO HARM REDUCTION?**

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Significance While ecigarette use might support smoking reduction or cessation, it is not clear how smokers who find it hard to stop smoking perceive using ecigarettes instead of smoking. This qualitative study aimed to explore the experiences and attitudes towards tobacco harm reduction of smokers who are motivated but unable to stop smoking. **Method** A qualitative semistructured interview study was conducted in London, the United Kingdom in 2019. Study participants were 20 adult (aged 18+) smokers of at least 5 cigarettes a day, who were not using ecigarettes daily and had tried but failed to stop smoking in the last 6 months. The interview data were audio-recorded, transcribed and analysed by Iterative Categorisation. **Results** Most participants were young adults who smoked less than 10 cigarettes a day, reported low-to-moderate dependence and were motivated to stop smoking soon. They knew about smoking-related harms but did not recall experiencing any themselves. Many participants thought they were psychologically addicted to smoking; this contrasted with their perceptions of physical addiction which would be indicated by cravings and the need for nicotine. Consequently, participants who did not report nicotine cravings also rejected the idea of using e-cigarettes as an alternative nicotine source—they believed that willpower should suffice to help them stop smoking. Participants' perceptions of ecigarette use harms were driven more by their addiction potential than lower health risks compared with smoking—more frequent



e-cigarette use was thought to present a risk of stronger addiction and harm than less frequent smoking. **Conclusion** Young and light smokers who want, but recently failed, to stop smoking were interested in either continuing or stopping smoking; use of e-cigarettes, as an option to reduce tobacco-related harm, held little appeal.

FUNDING: Academic Institution; Nonprofit grant funding entity

PAPER SESSION 24: TOBACCO CONTROL IN LOW AND MIDDLE INCOME COUNTRIES

POD24-1

EVALUATION OF TOBACCO CONTROL POLICIES IN ZAMBIA: FINDINGS FROM THE ITC ZAMBIA SURVEYS

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Significance: The International Tobacco Control (ITC) Zambia Project is designed to evaluate the effectiveness of Zambia's tobacco control policies under the WHO Framework Convention on Tobacco Control (FCTC), which Zambia ratified in 2008. There have been few studies of FCTC policy impact in the African Region, despite projections that smoking will rise to a greater extent in Africa than in any other region in the coming years. **Methods:** The ITC Project conducted two waves of a cohort study in Zambia among a nationally representative sample of 1,500 tobacco users and 600 non-users aged 15+ years in 2012 and 2014. The retention rate was 61%. The survey included validated measures used in ITC surveys across 29 countries on the effectiveness of key FCTC policies, and we compared policy effectiveness in Zambia to other ITC countries. **Results:** Key findings from Wave 2 were: (1) Continuing high rates of secondhand smoke inside bars (reported by 71% of tobacco users and 50% of non-users) and indoor workplaces (reported by 27% of tobacco users and 9% of non-users); this is high compared to the relatively low smoking prevalence in Zambia; (2) Compared to other ITC countries, smokers in Zambia were least likely (22%) to notice the single cigarette text warning "often" or "very often"; (3) Smokers in Zambia had low awareness of the specific harms of smoking: they were least likely of all ITC countries to be aware that smoking causes lung cancer (79%) and heart disease (74%); (4) Only 29% of smokeless tobacco users (most are women) were aware that smokeless tobacco causes mouth cancer; (5) Half (51%) of smokers bought loose cigarettes; and (6) There is growing support among even tobacco users for the government to do more to reduce tobacco use. **Conclusions:** Zambia's policies continue to be relatively low in effectiveness compared to other ITC countries, highlighting the need for the much-delayed tobacco control bill in Zambia, calling for comprehensive smoke-free laws, large pictorial warnings, tobacco tax increases, a ban on single cigarette sales, and anti-tobacco education campaigns. Furthermore, tobacco users themselves support stronger policies.

FUNDING: Federal; Nonprofit grant funding entity

POD24-2

EXPOSURE TO SECONDHAND SMOKE IN PUBLIC PLACES IN KENYA AND ZAMBIA: FINDINGS FROM ITC KENYA AND ZAMBIA SURVEYS

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Significance: Well-enforced comprehensive smoke-free laws are necessary to fully protect the public from secondhand smoke (SHS). But almost no studies have assessed the level of SHS in African region countries. This study assessed the level of exposure to SHS and support for smoking bans in public places among smokers and tobacco non-users (non-smokers) in Kenya and Zambia. **Methods:** Data were drawn from the 2018 ITC Kenya (KE) and 2014 Zambia (ZM) Surveys (KE: n=1,366; ZM: n=1,711) of adult smokers and non-smokers. Key measures were: (a) All respondents: whether they had noticed people smoking inside bars, workplaces, restaurants, public transportation and hospitals; (b) Smokers: whether they had smoked inside these venues; (c) All respondents: whether they supported smoking bans inside these venues. Logistic regression models were adjusted for age and time-in-sample. **Results:** Smoking was highest in bars, as reported by both smokers at last visit (KE: 78%; ZM: 71%) and non-smokers (KE: 62%; ZM: 50%). 66% of KE smokers and 61% of ZM smokers reported smoking in bars at last visit. Smokers were more likely than non-smokers to notice smoking inside their workplace (KE: 27% vs. 7%; ZM: 27% vs. 9%). More than a quarter of smokers in KE (28%) and ZM (30%) reported smoking inside their workplace. Smoking in restaurants, public transportation, and hospitals was very low (3-6%). Support for smoking bans in indoor workplaces was very high among non-smokers (KE: 96%; ZM: 84%) and even



among smokers themselves (KE: 78%; ZM: 82%). Support for smoking bans in bars was also high among non-smokers (KE: 67%; ZM: 71%) and smokers (KE: 45%; ZM: 66%). **Conclusions:** There is a need to improve enforcement of existing smoke-free policies and strengthen smoke-free laws in Zambia and Kenya, especially in bars and workplaces, by implementing a comprehensive national smoking ban, including banning designated smoking areas. Support among smokers in both countries for a smoking ban in bars was higher than in other ITC countries (e.g., Ireland, France) before those countries introduced smoking bans in bars; thus, industry claims that public opinion is a barrier to smoke-free laws are unfounded.

FUNDING: Federal; Nonprofit grant funding entity

POD24-3

THE PERCEIVED RELATIVE HARM OF COVID-19 AMONG MEXICAN ADULT SMOKERS

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Significance: As the relationship between COVID-19 and tobacco use continues to be examined, it is necessary to determine the perceptions that smokers have about the harms of COVID-19, which may influence smoking behaviors and prevention of COVID-19. Mexico is a country that has been highly affected by COVID-19, having one of the highest mortality rates in the world. The purpose of this study was to examine the relative harm perceptions of COVID-19 among Mexican smokers. **Methods:** 578 Mexican adult smokers and e-cigarette users were recruited in March 2020. Two items measured the perceptions of relative harm of COVID-19 infection for themselves compared to other people their age (relative harm for oneself) and relative harm of COVID-19 infection for smokers compared to non-smokers (relative harm for smokers). Logistic and multinomial regression models were used to find associations between severity and sociodemographic and tobacco use behaviors. **Results:** 81% of participants perceived higher relative harm for smokers, but only 37% of participants had high relative harm for oneself. After adjusting for sociodemographic characteristics, participants that intended to quit smoking were at increased odds of perceiving relative harm for oneself (AOR=1.51, 95% C.I. 1.06-2.16). Males had lower odds of perceiving higher relative harm for smokers (AOR=.53, 95% C.I. .34-.82). Participants that perceived relative harm for both oneself and smokers were more likely to be daily smokers (RR=2.39, 95% C.I. 1.57-3.63) and were more likely to believe that smoking has damaged their health (RR=1.75, 95% C.I. 1.09-2.80) than participants that only perceived harm for smokers. **Conclusion:** The majority of participants had higher perceived relative harm for smokers than for themselves, indicating possible optimistic bias of perceived harm of COVID-19 infection in smokers. Additionally, perceptions of harm varied based on smoking behaviors and sex. Communication about COVID-19 must address this optimistic bias and clearly portray the impact that tobacco use can have on subsequent infections.

FUNDING: Federal

POD24-4

FEMININE MARKETING APPEALS ON CIGARETTE PACKS IN 14 COUNTRIES OVER TIME

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In many low- and middle-income countries (LMICs), smoking among women is becoming more common. A range of advertising tactics have been used by the tobacco industry to market cigarettes to women in LMICs. However, limited research has examined the use of feminine marketing appeals on cigarette packs. Data were acquired from the Tobacco Pack Surveillance System project, which systematically collects unique cigarette packs sold in 14 LMICs: Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Pakistan, Philippines, Russia, Thailand, Turkey, Ukraine, and Vietnam. Trained coders assessed packs sold in 2013 (n=3240) and 2015-2017 (n=2457) for a wide range of design features, including feminine appeals. Packs were coded as feminine if they contained imagery or text associated with flowers, fashion, women/girls, and pink. All coding was reviewed by country experts. We examined trends in feminine appeals over time and by country, including co-occurrence with other pack features (slim stick size, flavor, reduced harm, and reduced odor claims). Overall, 8.1% of packs from 2013 and 5.6% of packs from 2015-17 contained feminine appeals. While all 14 LMICs sold feminine packs, the greatest proportion of packs purchased in Russia (2013, 19.6%; 2015-17, 13.5%) and China (2013, 7.3%; 2015-17, 7.9%) contained feminine appeals. Among all feminine packs, flower and fashion related features were the most common appeals

used over time. There was also a notable increase in imagery or text associated with women or girls from 2013 (10.6%) to 2015-17 (19.7%). Most feminine packs in 2013 (67.8%) and 2015-17 (50.4%) were "slims" and a substantial proportion were flavored (2013, 26.9%; 2015-17, 17.5%). While the presence of reduced odor claims was seen on one in five feminine packs in 2015-17, very few feminine packs contained reduced harm claims. A notable number of feminine packs were sold in the 14 LMICs over time. Results suggest that feminine appeals may be combined with other pack features like reduced odor claims, to target women in LMICs. Plain packaging standards may reduce the influence of such marketing tactics.

FUNDING: Nonprofit grant funding entity



PODIUM PRESENTATION 6

PAPER SESSION 25: CANNABIS VAPING AND SMOKING AMONG YOUTH AND YOUNG ADULTS

POD25-1

CHANGING MARIJUANA BEHAVIORS - THE EMERGENCE OF MARIJUANA VAPING

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Introduction. Young adult marijuana use is increasing, and most marijuana users are co-users of tobacco products. Frequently marijuana is co-administered with tobacco in tobacco products. For example, blunts combine cigar tobacco leaf wrappers with or without loose tobacco, along with marijuana. Other tobacco delivery products are also used with marijuana, like hand-rolled cigarettes (spliffs), hookah, and electronic nicotine delivery systems (ENDS). The purpose of this study was to examine trajectories of marijuana use in various tobacco products across a 3.5-year period among a cohort of young adults. **Methods.** Participants were 4,927 young adults (M age=21.0, SD=2.3; 64.2% female; 36.1% non-Hispanic white) from a 24-college study in Texas who participated in at least one of six waves from fall 2015 to spring 2019. The first four waves were bi-annual, and the final two waves were conducted yearly. Growth curve models were used to explore trajectories of marijuana use in hand-rolled cigarettes, cigars, hookah, and ENDS. The models were fit for six waves over a 3.5-year period and adjusted for sex, race/ethnicity, age, and 2-year versus 4-year college. **Results.** Linear models were the best fit for hand-rolled cigarettes and cigars. Neither linear trend was significant, indicating that using marijuana in hand-rolled cigarettes ($z=-0.73$, $p=.464$) and cigars ($z=-0.749$, $p=.454$) was constant across time. Quadratic models were the best fit for hookah and ENDS products. The combination of the linear ($z=-7.88$, $p<.001$) and quadratic ($z=5.11$, $p<.001$) trends of marijuana use in hookah resulted a rapid decrease from fall 2015 to spring 2017, at which point the trend stabilized. For vaping marijuana in ENDS products, the combination of the linear ($z=-2.40$, $p=.016$) and quadratic ($z=9.06$, $p<.001$) trends resulted in stable use for the first 1.5 years of the study, then a doubling in use from spring 2017 to spring 2019. **Conclusion.** The increasing trend of marijuana use in ENDS corresponds with the surge in popularity of vape pods in 2017 among young adults. Findings indicate that popular new ENDS devices may have created novel avenues for marijuana delivery.

FUNDING: Federal

POD25-2

YOUNG ADULTS' INCREASING USE OF MARIJUANA IN ENDS DEVICES

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Significance. Vaping marijuana has become increasingly popular among young adults, more than doubling nationally from 2017 to 2018 to almost 11.0%. Popular electronic nicotine delivery systems (ENDS) provide new avenues for marijuana delivery, although few studies have documented the specific devices young adults use to vape marijuana. The purpose of this study was to determine whether the prevalence of vaping marijuana increased among young adults and what factors increased the likelihood of vaping marijuana. **Methods.** Participants were 3,627 young adults (mean age=25.4 years, SD=2.3, 58% assigned female at birth, 35.3% non-Hispanic White) originally attending 24 colleges who took part in waves 7 and 8 (Spring 2018 and Spring 2019) of the Marketing and Promotions across Colleges in Texas study. McNemar's tests were used to examine changes in vaping marijuana from 2018 to 2019, and binomial logistic regression was performed to determine the associations between sex, race/ethnicity, age, sexual or gender minority (SGM) identity, current cigarette use, and current ENDS use (all assessed in 2018) and changes in vaping marijuana from 2018 to 2019. **Results.** From 2018 to 2019, the number of participants reporting vaping marijuana significantly increased from 12.5% to 16.5%, $p<.001$. Using a personal vaporizer/mod was most popular (13.9%), followed by disposable devices (6.7%), then vaping marijuana in a JUUL/pod device (5.5%). Logistic regression analyses demonstrated that male sex, non-Hispanic White race/ethnicity, older age, SGM identity, cigarette use, and ENDS

use were associated with increased probability of vaping marijuana. Overall, vaping marijuana was the second-most commonly reported mode of marijuana delivery in this sample of young adults, after combusted marijuana. **Conclusion.** The rapidly-expanding market of ENDS devices has created new avenues for marijuana delivery. Users of cigarettes and e-cigarettes may be driving this increase in vaping marijuana among young adults. Policy makers and tobacco researchers should consider the popularity of ENDS devices and their potential to influence on the marijuana behaviors of adolescents and young adults.

FUNDING: Federal

POD25-3

ASSOCIATION OF VAPING MARIJUANA AND SYMPTOMS OF DEPRESSION AMONG YOUTH

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Significance: Young people with depression and/or anxiety may self-medicate with nicotine or marijuana to reduce their symptoms. Limited research has considered tobacco products that are not "used as intended" and are modified, instead, to smoke marijuana (e.g., spliffs, blunts, vaping THC). This study sought to differentiate between the two. **Methods:** This is a secondary analysis of Wave 9 (Spring 2019) data from the Texas Adolescent Tobacco and Marketing Surveillance (TATAMS). Analysis sample was limited to those who had complete response on Patient Health Questionnaire-9 and Generalized Anxiety Disorder-7 items ($n=2436$; 15-19 years old). Adjusted logistic regression models assessed the odds of using combustible tobacco products (i.e., cigarettes, cigar products, hookah) or e-cigarettes, with or without marijuana, among participants reporting symptoms of (a) only anxiety, (b) only major depression (MDS) and (c) both. Those who reported no symptoms of anxiety or MDS served as the referent group. Models were adjusted for grade, gender, race/ethnicity and SES. **Results:** 10.0%, 9.6% and 2.8% of participants reported symptoms of both MDS and anxiety, only anxiety, and only MDS, respectively. Compared to those with no symptoms, the odds of ever and past 30-day use of combustible tobacco products with marijuana were significantly higher among participants with symptoms of both MDS and anxiety [AOR(95% CI): 1.77(1.33-2.36), 1.44(1.05-1.99)], as were the odds of past 30-day e-cigarette use with marijuana [AOR(95% CI): 2.22(1.45-3.40)]. Similarly, compared to those with no symptoms, the odds of ever and past 30-day use of combustible tobacco products with marijuana were significantly higher among participants with symptoms of only MDS [AOR(95% CI): 2.04(1.23-3.38), 2.07(1.16-3.70)], as were the odds of past 30-day e-cigarette use with marijuana [AOR(95% CI): 2.09(1.26-3.47), 1.87(1.04-3.35)]. No significant relationships between any product use and symptoms of only anxiety were found. Moreover, in only one instance was product use without marijuana related to symptoms of either MDS or anxiety [AOR(95% CI): 2.22(1.45-3.40) for past 30-day e-cigarette use and symptoms of both]. **Conclusion:** Marijuana, but not nicotine, use in tobacco products was consistently related to symptoms of only depression or symptoms of depression in combination with symptoms of anxiety. Interventions to address these disturbances in mental health should be informed by this finding.

FUNDING: Federal

POD25-4

PERCEIVED PRODUCT HARM AND INTENTIONS TO QUIT MARIJUANA- OR NICOTINE-CONTAINING VAPE PRODUCTS DURING THE EMERGENCE OF E-CIGARETTE/VAPING-ASSOCIATED LUNG INJURY (EVALI) IN THE UNITED STATES, AUGUST - DECEMBER 2019

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Background. The 2019 outbreak investigation of e-cigarette/vaping-associated lung injury (EVALI) identified THC-containing vape products as a primary cause. Over half of EVALI patients report concurrent use of THC and nicotine vape products, and a small proportion report using nicotine vape products exclusively. Studies of EVALI's clinical course and risk factors were drawn from patient interviews and hospital records, but population-level studies are needed to assess risk factors for exposure to vape prod-

**PAPER SESSION 26: UPDATES ON WOMEN AND SMOKING****POD26-1****MATERNAL DEPRESSIVE SYMPTOMS ARE ASSOCIATED WITH POSITIVE SCREENS FOR COTININE AND THC DURING PREGNANCY**

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Significance. Prenatal tobacco use often occurs in the context of prenatal cannabis use, especially among younger pregnant women. Dual exposure to tobacco and cannabis may result in more adverse infant outcomes than exposure to prenatal tobacco only. The goal of this study is to identify psychosocial correlates of dual exposure to tobacco and cannabis during pregnancy. **Methods.** Young pregnant women (15 - 22 years old) were recruited from obstetric clinics and participants completed a tablet survey of their tobacco and cannabis use. Psychosocial factors linked to prenatal tobacco and cannabis use (e.g., pregnancy intendedness, depressive symptoms, perceived stress, interpersonal violence, morning sickness, social support) were also assessed. In addition, available clinical urine specimens (n = 62) were screened for cotinine (COT) and THC by research staff. **Results.** Seventy-five women participated in the study (71% Black/Biracial, 29% White). Forty percent of the urine samples were positive for cotinine and 41% were positive for THC. Eighty-eight percent of the women who screened positive for COT reported daily or weekly tobacco use after pregnancy recognition, and 74% of them had smoked blunts. All the women who reported daily cannabis use and 93% of those reporting weekly use had a positive urine screen for THC. Thirty-one percent of the sample screened positive for both COT and THC (dual exposure). Depressive symptoms were associated with dual exposure, even after controlling for other tobacco smokers in the home. Moreover, although depressive symptoms were linked to positive screens for COT and THC separately, the association with dual COT and THC was stronger. **Conclusions.** Prenatal exposure to COT and THC was prevalent in this sample of younger pregnant women and was associated with depressive symptomatology. This triad of risk exposure reinforces the importance of screening for all three issues during obstetric visits. These results have implications for tobacco smoking cessation efforts in pregnant young women experiencing depressive symptoms, and for infant outcomes related to both maternal depression and prenatal exposure to tobacco and cannabis.

FUNDING: Federal

POD26-2**PILOT RANDOMIZED CONTROLLED TRIAL OF QUIT TOGETHER, A 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 the efficacy of a smoking cessation intervention for couples during and after pregnancy in Romania. **Methods:** Quit Together, completed in 2020, randomized 91 pregnant smokers (45-intervention, 46-control) and their life partners in Romania. Eligibility criteria included age \geq 18; pregnant; smoker; married or with a stable partner; and willing to share partner contact information. 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 clinics and other relevant locations. Quit Together is a prenatal and postpartum telephone counselling program building on the Motivation and Problem Solving (MAPS) approach enhanced by targeting the couples' smoking behavior and focusing on the dyadic efficacy for smoking cessation. **Results:** A total of 91 pregnant smokers and 78 spouses were randomized in Quit Together. The women postpartum follow-up rate was 79% (N=72/91). The mean age was 29, ranging from 18 to 39. Over 44% graduated college, and 66% of the pregnant smokers had moderate-high nicotine dependence. The intervention increased the 7-day point abstinence at 4 month

ucts that are linked to EVALI. Understanding young adult vape users' attitudes about marijuana vape use, relative to nicotine or flavored non-nicotine vape use, can inform health communication and other interventions. This study compares demographic characteristics, perceptions and behavioral intentions among young adults who were vaping marijuana (including THC) or nicotine/flavors during the 2019 EVALI outbreak.

Methods. Data were drawn from a wave of the Truth Longitudinal Cohort, a nationally representative, probability-based sample of youth and young adults, fielded during the EVALI outbreak (August-December 2019). The analytic sample was limited to respondents aged 18-34 (n=10,268) to describe patterns of use by vape product type. Logistic regression was conducted among past 30-day vape users (n=1,474) to identify differences in harm perceptions and quit intentions by vape product type (marijuana with or without nicotine/flavors vs. nicotine/flavors only), controlling for demographic factors. **Results.** Age, race/ethnicity, gender, and education varied by vape product type. Perceived product harm was significantly higher among users of marijuana vape products compared to those who used only nicotine/flavored vape products. Despite higher perceptions of product harm during the EVALI outbreak, intentions to quit vaping were significantly lower among those who vaped marijuana compared to other vape users. **Conclusions.** These findings can inform the targeting of health communication and other population-level interventions concerning EVALI. Future research is needed on vape users' behavioral responses to EVALI outbreaks according to product type.

FUNDING: Unfunded

POD25-5**AGE-VARYING ASSOCIATIONS BETWEEN CIGARETTE SMOKING INITIATION AND CANNABIS USE AMONG CHILEAN ADOLESCENTS**

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Cigarette and cannabis use are highly prevalent among Chilean adolescents with 33% reporting cigarette use and 31% reporting cannabis use in the past year. Importantly, many (33%) Chilean adolescents report using both substances, with cigarette smoking serving as a risk factor for cannabis use. However, how the association between later cannabis use varies as a function of age of cigarette smoking onset has not been previously examined in this population. Data were from the 2017 Chilean National Service of Drugs and Alcohol Use Prevention and Rehabilitation, a cross-sectional sample of 6,220 17-year-old high school students (59% female). Participants reported their age of first cigarette use and their past 30-day frequency of cannabis use. Time-varying effect modeling identified the age-varying prevalence of cannabis use and frequency of use as a function of age of cigarette smoking onset. Results indicate that the prevalence of recent cannabis use was higher among individuals who reported an earlier age of smoking initiation. Among those who began smoking cigarettes at age 10, the prevalence of cannabis use at age 17 was 65%; conversely, individuals who initiated smoking at age 17 reported less frequent cannabis use in the past 30 days (36%). Gender differences were also observed; while frequency of cannabis use followed a similar pattern for boys and girls across age of onset, significant differences were observed when the age of cigarette onset was between 13-16 years. Boys who initiated cigarette onset between ages 13-16 reported significantly more frequent cannabis use in the past 30 days relative to girls who began smoking at these ages. Our results suggest that age of initiation of cigarette smoking might play a role in cannabis use such that earlier onset of cigarette use is associated with more frequent cannabis use in late adolescence. Prevention efforts targeted toward delaying cigarette initiation among adolescents could potentially decrease later cannabis use, especially among boys.



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postpartum follow-up by 31.6% overall (20% vs 15.2%) and by 36% (27.2% vs 20%) among those followed-up. The intervention increased the self-reported pregnancy quit rate by 15.6% overall (37.7% vs 32.6%) and by 20% (51.6% vs 42.9%) among those followed-up. More women self-reported relapsing postpartum in the intervention group (52.9% vs 40%). Biochemically confirmed abstinence rates postpartum were higher in the intervention group 11.4% (4/35) vs 8.1% (3/37). **Conclusion:** Motivation and problem-solving telephone counseling with pregnant couples showed promise in increasing prenatal smoking cessation and postpartum smoking abstinence. The postpartum component of the program needs to be strengthened. There is initial support for Quit Together as an efficacious program for pregnancy smoking cessation.

FUNDING: Federal

POD26-3

EFFECT OF SEX HORMONES ON WORKING MEMORY BOTH DURING ABSTINENCE AND FOLLOWING NICOTINE EXPOSURE

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Significance Withdrawal from chronic nicotine exposure has been associated with impaired cognitive performance. Current literature suggests that nicotine use behavior is affected by sex hormones which have been found to influence smoking behavior and nicotine craving. Further, both nicotine use and abstinence influence domains of cognitive function such as memory. This investigation aimed to determine if progesterone level, estradiol level, and progesterone/estradiol ratio are associated with performance on the N-back working memory task in smokers following acute abstinence and nicotine exposure. **Methods** The data is from a double-blind study where oral contraceptive-using female smokers were randomly assigned to two 9-day crossover testing periods of twice daily doses of either 200mg of exogenous progesterone or placebo. Hormone levels were collected on day 9. Following overnight abstinence, participants completed the N-back task on day 9 both before and after nicotine nasal spray exposure. **Results** The average age of the 32 participants included in the analysis was 23.2 years old (SD=3.5) with an average consumption of 10.9 cigarettes per day (SD=4.6). The median hormone levels were 6.5 ng/mL for progesterone, 0.073 ng/mL for estradiol, and 83.9 for progesterone/estradiol ratio. There was no association between hormone levels and N-back performance before or after nicotine exposure. **Conclusion** The findings suggest that working memory in female smokers is unlikely to be affected by exogenous progesterone at 400mg/day with physiologic hormone levels. The constricted degree of change suggests expanding the study would unlikely produce meaningful results. Perhaps higher levels of progesterone may lead to significant changes.

FUNDING: Federal

POD26-4

FEASIBILITY AND ACCEPTABILITY OF TIMING QUIT DATE TO MENSTRUAL PHASE IN A QUITLINE SETTING: RESULTS FROM A PRELIMINARY RANDOMIZED TRIAL

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Introduction: Compared to men, women are more likely to relapse from a quit attempt. In addition, among women of reproductive age, quitting is often influenced by ovarian hormones. Tailoring standard care treatments (e.g., quitlines) to incorporate the role of these hormones in the quitting process has potential to improve cessation outcomes in this population. Therefore, the goal of this preliminary randomized clinical trial was to examine the feasibility and acceptability of timing quit date to the follicular phase in women quitting via a quitline setting. **Methods:** We recruited treatment-seeking women between the ages of 18-40 who smoked at least five cigarettes/day and who wanted to quit smoking via a state quitline and social media advertising. Participants were randomized (1:1 ratio) to either the follicular phase (FP; quit day scheduled 6-8 days post onset of menses) or standard care (SC; quit date not timed to the menstrual cycle). All participants received four weeks of nicotine replacement therapy patch concurrent with six weeks of telephone-based behavioral counseling. Smoking cessation outcomes were assessed at end of treatment. **Results:** A total of 119 women were enrolled with 58 randomized to FP and 61 to SC. Participants were mostly white (79.8%) and, on average, were 33.4 years old and smoked 13.6 cigarettes/day. We retained 69% of participants to quit date (57% FP; 79% SC) and 59% completed the counseling intervention (53% FP; 64% SC). Most participants reported that it was "not at all" a burden to participate (88.5%). Based on self-reported seven-day point prevalence, 52.8% of FP and 58.1% of SC were abstinent at end of treatment. **Conclusions:** The results of this preliminary trial indicate that timing quit date to menstrual phase is an acceptable and feasible

approach to addressing smoking cessation in women of reproductive age. While these data suggest similar cessation rates between study groups, this study was not fully powered to determine efficacy, nor were these rates biochemically verified. Overall, these results indicate that a fully-powered efficacy trial is warranted.

FUNDING: Federal

POD26-5

THE EFFECT OF E-CIGARETTE TAXES ON PRE-PREGNANCY AND PRENATAL SMOKING

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Significance: According to National Health Interview Survey (NHIS) data from 2014 to 2017, 38.9% of pregnant smokers used e-cigs compared to only 13.5% of non-pregnant, reproductive age women smokers. High e-cig use by pregnant women may be driven by a belief that e-cigs are a safer product than cigs during pregnancy, but the relative risks of cig versus e-cig use during pregnancy are unknown. E-cig taxes are intended to lower e-cig use rates, but no studies have estimated the effect of these taxes on pregnancy-related e-cig and cig use directly. Birth outcomes could also be affected by changing cig and e-cig use rates in response to e-cig taxes. **Methods:** We use the universe of birth records in the United States from 2013 to 2018 to examine the effect of e-cig tax rates on pre-pregnancy and prenatal cig use. We also use Pregnancy Risk Assessment Monitoring System data from 2016 to 2018 to study pre-pregnancy and prenatal e-cig use. We evaluate the effect of e-cig taxes occurring in 10 states and 2 major counties by the end of 2018. We use difference-in-difference-like regression modelling that controls for county fixed effects, year-by-quarter fixed effects, other tobacco control policies (including cig taxes), and demographics. **Results:** A \$1 increase in e-cig taxes reduces pre-pregnancy e-cig use 1.3 percentage points ($p<0.01$) and reduces 3rd trimester e-cig use by 0.9 percentage points ($p<0.01$). A \$1 increase in standardized e-cig taxes meanwhile increases both pre-pregnancy and prenatal cig use by 0.4 percentage points ($p<0.05$). Overall we find little consistent evidence of e-cig taxes affecting gestational or birth weight-related outcomes. **Conclusion:** Using plausibly exogenous variation in e-cig taxes, we find that these taxes reduce pre-pregnancy and prenatal e-cig use, but they also have the unintended effect of increasing pre-pregnancy and prenatal cig use. This substitution may explain why we find little evidence of e-cig taxes improving birth outcomes.

FUNDING: Federal

**PODIUM PRESENTATION 7****PAPER SESSION 27: NAMING MECHANISMS DRIVING HEALTH DISPARITIES****POD27-1****THE ELEPHANT IN THE ROOM: A SCOPING REVIEW OF NAMING RACISM IN TOBACCO CONTROL**

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Significance: Racism is a determinant of health and driver of racial disparities, including tobacco-related disparities. However, little is known about the extent to which the tobacco control field has examined racism, not race, as a risk factor. This scoping review explored how racism has been named and framed within the tobacco control literature, using a critical race lens. **Methods:** We conducted a systematic search of six tobacco specific journals (e.g., Tobacco Control) for relevant articles published between January 2000 - July 2020. Articles were included if in English and race/ethnicity and/or racism were important to the study. Reviewers screened 199 article titles and abstracts, followed by 41 full-text reviews. Data abstraction captured the area of tobacco (e.g., cessation), if and how racism was named (e.g., explicitly, implicitly), and form of racism (e.g., internalized, interpersonal, institutional). **Results:** The final sample included 38 articles. Roughly 21% of articles were published in a single year, 2016, and 81.5% were published by one journal, Nicotine and Tobacco Research. Tobacco product initiation or use was described most frequently (42%), in comparison to cessation, policy, or advertising. Although the majority (86.8%) of articles alluded to discrimination, only 18.4% explicitly named racism. Institutional/structural racism was the most frequent (63.2%) form of racism, but proportions varied depending on whether racism was named explicitly (85.7%) or implicitly (69.2%). Even if named, racism was not always the focus of the article (n=7, 21.2%), as terms appeared primarily in the background or discussion of articles. **Conclusions:** Findings highlight the need for future tobacco studies to include racism as a variable, as well as explicitly name racism and/or define race as a risk marker for racism-related exposures. Journals should issue calls for papers in this area and consider any biases in the review process that may deter authors from explicitly naming racism. Health equity in tobacco control can only be accomplished by identifying and confronting racism, which lies at the root of tobacco-related health disparities.

FUNDING: Unfunded

POD27-2**RACE/ETHNICITY AND THE IMPACT OF CUMULATIVE ADVERSITIES ON SMOKING TRAJECTORIES AMONG CURRENT SMOKERS IN THE U.S.: RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY**Jaqueline Avila¹, Nikki Nollen², Juhan Lee³, Christopher Schmid¹, Jasjit Ahluwalia¹. ¹Brown University School of Public Health, Providence, RI, USA, ²University of KS School of Medicine, KS City, KS, USA, ³University of Florida, Gainesville, FL, USA.

Significance: Racial/ethnic differences in quitting cigarettes in the U.S. are well known, yet, few studies examine reasons for this disparity. Racial/ethnic minorities in the US experience socioeconomic and health adversities at greater rates. This study examined if these adversities explain racial/ethnic differences in abstinence among US smokers. **Methods:** Data from 7,279 established smokers were identified in Wave 1 of the Population Assessment of Tobacco and Health (PATH) and followed through Wave 4 to assess quitting cigarettes (yes/ no). The main independent variables were race/ ethnicity (Non-Hispanic White [NHW], Non-Hispanic Black [NHB] and Hispanic [HISP]), and a composite score of 8 adversities for tobacco-use disparity including: unemployment, poverty, difficulty with money, lower education level, lack of health insurance, disability, psychological distress, and binge drinking. These were categorized into: 0, 1, 2-3, or 4+ adversities. Weighted logistic regression was used to estimate the odds of quitting, adjusting for race/ethnicity and the adversity score. **Results:** HISP and NHB were more likely to have 4+ adversities than NHW (25.0%, 24.3%, 16.9%, p<0.001, respectively). HISP were more likely to quit (23.5%), followed by NHW (18.2%) and NHB (14.7%). The unadjusted results by race/ethnicity showed that compared to NHW, NHB were less likely to quit (OR: 0.77; 95%CI: 0.62- 0.97) but HISP were more likely to quit (OR: 1.39; 1.16- 1.65). After adjusting for the adversity score, the difference in quitting be-

tween NHW and NHB was non-significant (OR:0.84; 0.67-1.07), while HISP remained significantly more likely to quit than NHW (OR: 1.48; 1.24-1.77). **Conclusions:** NHB and NHW smokers had equal probability of quitting smoking at similar levels of adversity, highlighting socioeconomic disadvantage, which is more pronounced among NHB in the US, as a root cause of lower quit rates among NHB smokers. HISP are still consistently more likely to quit, despite similar adversity as NHB. There is a need to understand if this advantage continues with long-term quitting. **Funding:** National Institute of Health, Center of Biomedical Research Excellence (COBRE) (grant number P20GM130414)

FUNDING: Federal; Academic Institution

POD27-3**A LONGITUDINAL ANALYSIS OF SMOKE-FREE LAWS AND SMOKING DISPARITIES AMONG YOUNG ADULTS IN THE UNITED STATES**Andrea R. Titus¹, Yanmei Xie¹, James F. Thrasher², David T. Levy³, Michael R. Elliott¹, Megan E. Patrick⁴, Nancy L. Fleischer⁵. ¹University of Michigan, Ann Arbor, MI, USA, ²University of SC, Columbia, SC, USA, ³Georgetown University, Washington, DC, USA, ⁴University of Minnesota, Minneapolis, MN, USA, ⁵University of MI, Ann Arbor, MI, USA.

Significance: Understanding heterogeneous patterns of smoking initiation in young adults is critical to reducing smoking-attributable health outcomes in vulnerable groups. Few longitudinal studies have explored the relationship between smoke-free laws and smoking initiation, particularly with regard to health equity. **Methods:** We combined information on county-level smoke-free law coverage of workplaces and hospitality venues (restaurants/bars) with nationally representative data on high school seniors from the Monitoring the Future Survey (baseline data collected between 2000 and 2017). Using modified Poisson regression and calculating average marginal effects (AMEs), we explored longitudinal associations between smoke-free law coverage and two smoking outcomes (any smoking initiation and daily smoking initiation) at three modal ages: 19/20, 21/22, and 23/24. We examined effect modification by sex, race/ethnicity, and parental education by testing the significance of interaction terms on the additive scale. **Results:** Workplace law coverage was associated with a 1.7 percentage point (p.p.) lower probability of any smoking initiation at modal age 21/22 (95% CI: -0.033,-0.000), a 2.5 p.p. lower probability of daily smoking initiation at modal age 21/22 (95% CI: -0.039,-0.011), and a 2.7 p.p. lower probability of daily smoking initiation at modal age 23/24 (95% CI: -0.044,-0.010). Hospitality law coverage was associated with a 1.6 p.p. lower probability of daily smoking initiation at modal age 19/20 (95% CI: -0.027,-0.004), a 2.2 p.p. lower probability of daily smoking initiation at modal age 21/22 (95% CI: -0.036,-0.009), and a 2.1 p.p. lower probability of daily smoking initiation at modal age 23/24 (95% CI: -0.037,-0.005). The relationship between hospitality smoke-free laws and the reduced likelihood of any smoking initiation was most pronounced among young adults from families with parental education levels of high school or less. **Conclusions:** Exposure to smoke-free laws in 12th grade was prospectively associated with reduced smoking initiation 1-6 years later. Hospitality smoke-free laws may have a pro-equity impact on smoking initiation.

FUNDING: Federal

POD27-4**SMOKE-FREE LAWS AND DISPARITIES IN SECONDHAND SMOKE EXPOSURE AMONG NONSMOKING ADULTS IN THE UNITED STATES, 1999-2014**Andrea R. Titus¹, James F. Thrasher², Kristi E. Gamarel¹, Rafael Meza¹, Nancy L. Fleischer³. ¹University of Michigan, Ann Arbor, MI, USA, ²University of SC, Columbia, SC, USA, ³University of MI, Ann Arbor, MI, USA.

Significance: Despite declines in secondhand smoke (SHS) exposure in the U.S., disparities by race/ethnicity, socioeconomic status, and gender persist. Little is known about the relationship between smoke-free laws and heterogeneous patterns of SHS exposure among nonsmoking adults. **Methods:** We constructed time-varying county-level smoke-free law measures representing whether or not at least 50% of each county's population was covered by smoke-free laws in workplaces and hospitality venues (restaurants/bars). We merged this data with restricted individual-level data on cotinine-derived SHS exposure among nonsmokers from the National Health and Nutrition Examination Survey, 1999-2014 (N=25,444). Using logistic regression, we estimated associations between



smoke-free law coverage and SHS exposure among all nonsmokers, and within age strata (25-39, 40-59, 60+), including for interaction assessments. We explored differential associations by gender, race/ethnicity, education, and poverty income ratio (PIR) by testing the significance of interactions terms on the additive scale. Results: In adjusted models, hospitality smoke-free law coverage was associated with lower odds of SHS exposure in the full sample (odds ratio/OR=0.62; 95% confidence interval/CI=0.51-0.76), and within each age group, with ORs ranging from 0.58 (ages 25-39) to 0.67 (ages 60+). Workplace smoke-free coverage was associated with lower SHS exposure only among younger adults (OR=0.81; 95% CI=0.65-0.99). Within the full sample and among adults ages 40-59, hospitality smoke-free laws were associated with narrowing SHS exposure differentials between males and females. Among adults ages 40-59, workplace smoke-free laws were associated with narrowing SHS exposure differentials between males and females, but worsening exposure disparities by PIR. Conclusions: Smoke-free laws appear to reduce SHS exposure among adult nonsmokers, but some differential associations suggest the importance of evaluating potential impacts on health equity.

FUNDING: Federal; Academic Institution

PAPER SESSION 28: EVALUATIONS OF NATIONAL MEDIA CAMPAIGNS

POD28-1

CDC'S 2019 TIPS FROM FORMER SMOKERS® CAMPAIGN A FORMATIVE EVALUATION OF TELEVISION ADVERTISEMENTS AMONG ADULTS WHO SMOKED CIGARETTES

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SIGNIFICANCE: CDC's *Tips*® campaign features real people living with the effects of smoking-related diseases. Ads also feature stories of family members impacted by their loved one's smoking-related illness. In 2018, CDC tested rough-cut advertisements to be aired during the 2019 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 tested six 30 second ads (*Beatrice's Tip*, *Christine's Head of Household*, *Christine's Quit Smoking for Those Who Love You*, *Dana's Impact on Family*, *Leonard Nimoy's More Time*, and *Terrie's I Wish*) and one 15 second ad (*Wilma's Tip*) using a convenience sample (n = 19,118) of adult smokers and nonsmokers who were online panelists. Smokers (n = 10,656) were stratified by socioeconomic status (low-SES vs. non-low-SES) and by age (18-26 vs. 27-54). Smokers completed an online survey that assessed message comprehension, perceived effectiveness (PE), believability, confusion, and whether the ad motivated them to quit smoking. Smokers were randomized to one of the seven rough-cut ads being tested. CDC uses PE (the average of a five-point scale) in formative evaluation to select ads that have the potential to motivate smokers to quit. **RESULTS:** Among smokers, PE scores ranged from 3.70 to 4.12, with *Dana's Impact on Family* (4.12) receiving the highest. Across all ads, 78% of smokers found the ads believable, and 70% reported that the ads made them want to quit smoking. *Dana's Impact on Family* had the highest proportion of smokers reporting the ad motivated them to quit smoking (75%). *Wilma's Tip*, *Terrie's I Wish* and *Dana's Impact on Family* all had the largest proportion of smokers (74%) reporting that they trust the information in the ad. *Leonard Nimoy's More Time* had the highest proportion of smokers reporting that they learned something new after viewing this ad (54%). **CONCLUSION:** The high PE scores indicate that the 2019 *Tips*® ads had the potential, when aired, to motivate quit behaviors among adult smokers.

FUNDING: Federal

POD28-2

EFFECT OF A NATIONAL TOBACCO PUBLIC EDUCATION CAMPAIGN ON YOUTH'S RISK PERCEPTIONS AND BELIEFS ABOUT VAPING AND SMOKING

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OBJECTIVE. To assess the relationship between youth's exposure to the Food and Drug Administration's national tobacco public education campaign, *The Real Cost*, and changes in campaign-targeted risk perceptions and beliefs. **METHODS.** A nationally representative cohort study of youth was conducted during June 2018 to July 2019, consisting of a baseline and one follow-up survey. We performed logistic regressions to examine the association between campaign exposure and beliefs. Exposure was measured by self-report as the frequency of exposure to individual campaign advertisements about the health consequences of vaping (i.e., ENDS) and of smoking cigarettes. **RESULTS.** We found that increased levels of advertising about the health consequences of vaping and smoking cigarettes were associated with a significant increase in the odds of reporting agreement with campaign-targeted beliefs. For example, those who were exposed to the campaign ad "Re-Hacked" were 21% more likely to agree with the belief "The nicotine in vapes may hack your brain." (adjusted odds ratio [aOR] = 1.21, p<0.001). Similarly, those who were exposed to the campaign ad "Little Lungs" were 17% more likely to agree with the belief "If I smoke, I will have small lungs." (adjusted odds ratio [aOR] = 1.17, p<0.001). Positive patterns of findings were found across multiple items targeted by specific ads, while non-related beliefs were not associated with ad exposure. **CONCLUSIONS.** A sustained national tobacco public education campaign can change population-level beliefs about the harms of vaping and smoking among youth. Combined



with other findings from The Real Cost, this evidence indicates that prevention mass media campaigns continue to be an effective and cost-efficient approach to reduce the health and financial burden of tobacco use in the U.S.

FUNDING: Federal

POD28-3

ASSESSING THE EFFECTS OF THE TRUTH CAMPAIGN ON YOUTH AND YOUNG ADULT SMOKING BEHAVIOR BY DEMOGRAPHIC SUBGROUPS

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Mass media campaigns are an effective population-level intervention for preventing tobacco use among young people. However, little evidence exists for whether these campaigns can similarly influence demographic subgroups at high risk for tobacco use, such as racial/ethnic minorities, those in lower income groups, or those living in rural, low population density areas. This study compared the overall effect of the national truth Finisht campaign on youth and young adults to the effects among demographic subgroups at high risk for tobacco use. Data were from a national, continuous, cross-sectional tracking survey of 15-24-year-olds. The sample for this study included respondents who completed a survey between July 2015 - August 2018 (n=32,331). An aggregate weekly measure of ad awareness was used to assess the effects of the campaign on current smoking and intentions to smoke among youth and young adults overall, and among race/ethnicity, financial situation, and population density subgroups. Among the overall sample, results indicated that weeks with aggregate ad awareness greater than 65% were associated with lower odds of current smoking, and weeks with aggregate awareness levels greater than 70% were associated with lower intentions to smoke (vs. weeks with 35-65% awareness). Examining the estimates across the three subgroup categories in light of the overall model estimates revealed that the effects on current smoking and intentions to smoke were similar across the subgroups. Wald tests of equality across estimates in each subgroup confirmed that the estimates did not differ from one another in any given instance. The truth Finisht campaign does not differ significantly in its capacity to prompt declines in tobacco use across a broad spectrum of youth and young adults. Results show that a single comprehensive anti-tobacco campaign can also impact the tobacco use behaviors of young people in demographic subgroups at high risk for use. To promote success, campaign developers should ensure sufficient message reach and delivery to population segments, employ diversity in characters and context, and message on issues that young people care about.

FUNDING: Other

POD28-4

CAMPAIGN EVALUATION FINDINGS FOR THE THIS FREE LIFE COMMUNICATION CAMPAIGN TO PREVENT AND REDUCE DAILY CIGARETTE USE AMONG LGBT YOUNG ADULTS IN THE UNITED STATES

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SIGNIFICANCE: In 2016, the U.S. Food and Drug Administration (FDA) launched the *This Free Life* three-year paid media campaign designed to prevent and reduce cigarette use among Lesbian, Gay, Bisexual and/or Transgender (LGBT) young adults aged 18 to 24 who smoke cigarettes occasionally. The messaging strategy in this primarily digital media campaign sought to create alignment between positive aspects of living tobacco-free and LGBT community values using authentic messages delivered by community members with the goal of decreased escalation to daily smoking. **METHODS:** RTI's evaluation of *This Free Life* sought to determine whether tobacco-related attitudes and beliefs between respondents in treatment and control markets differed over time and as a function of campaign exposure. The evaluation used a repeated cross-sectional treatment-control design with an embedded longitudinal cohort over seven waves of data collection (Baseline and 6 follow-ups), with new participants recruited at each wave to account for attrition (total N= 12,344). This analysis focused primarily on difference-in-difference comparisons between respondents in treatment and control markets to estimate the impact of the campaign on tobacco-related attitudes and beliefs. We also provide descriptive data on brand awareness, video ad awareness, ad

perceived effectiveness, and brand equity. **RESULTS/CONCLUSION:** Campaign brand awareness peaked at 69% and video awareness peaked at 60%. Significant differences in awareness between treatment and control markets confirmed the fidelity of campaign delivery. Measures of brand equity and ad receptivity suggest that the campaign was broadly well-received by LGBT subgroups. However, few changes in targeted attitudes and beliefs were found. We observed significant difference-in-difference treatment effects for four beliefs measuring specific social aspects of smoking, with changes in campaign markets 2.4 - 5.1 percentage points larger than in control. The presentation will summarize lessons learned from this novel campaign, including discussion of possible reasons (e.g. message strategy, digital media delivery and frequency) for the campaign evaluation results.

FUNDING: Federal

POD28-5

REACH, RECEPTIVITY, AND BELIEF CHANGE ASSOCIATED WITH THE FRESH EMPIRE CAMPAIGN TO PREVENT AND REDUCE CIGARETTE USE AMONG HIP HOP YOUTH IN THE UNITED STATES

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BACKGROUND: In 2015, FDA's Center for Tobacco Products launched *Fresh Empire*, a public education campaign for multicultural youth. *Fresh Empire* was designed to prevent and reduce tobacco use among at-risk 12 to 17-year-olds who identify with Hip Hop culture and to associate living tobacco-free with desirable Hip Hop lifestyles using various campaign activities over 4 years (e.g. broadcast television, paid digital and social media). Campaign messaging encouraged youth to reach goals of being successful, authentic, attractive, and in control by living tobacco-free. **METHODS:** RTI's evaluation of *Fresh Empire* sought to determine whether campaign-targeted tobacco-related attitudes and beliefs differed over time as a function of campaign exposure. The evaluation used a repeated cross-sectional pre-post data collection design with an embedded longitudinal cohort over six waves of data collection with new participants recruited at each wave to account for attrition (Total N= 5,385; 41% non-Hispanic Black, 28% Hispanic). The analysis used exogenous market-level broadcast tv and digital video exposure in longitudinal panel regression models to assess potential campaign exposure's effect on agreement with attitudes and beliefs. We provide descriptive data on brand awareness, video ad awareness (awareness of any ad sometimes or more), ad perceived effectiveness (1-5 ascending scale) and brand equity items. **RESULTS/CONCLUSION:** The campaign generated a high level of reach (71% brand awareness and 66% video ad awareness at the last wave) and its brand and messages were well-received by the audience (across waves 3.53-4.11 mean perceived effectiveness scores and 56-87% agreement/strong agreement with brand equity items related to brand personality and loyalty). However, the campaign had a limited effect on targeted attitudes and beliefs. We observed a small effect of variation in broadcast tv exposure on outcomes related to addiction/control, being a bad influence on family/friends, and cosmetic effects of smoking (breath, attractiveness) (ORs= 1.16-1.27, (p< .05)). The presentation will discuss possible reasons for these findings (e.g. message strategy, digital media delivery).

FUNDING: Federal



PAPER SESSION 29: NOVEL THERAPEUTIC TARGETS FOR CESSATION

POD29-1

THE NICOTINIC RECEPTOR MODULATOR LYNX1 IN NICOTINE REINFORCEMENT

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Significance: Nicotine addiction is the largest cause of preventable disease and death worldwide, and current treatments are only moderately efficacious. Nicotine acts on nicotinic acetylcholine receptors (nAChRs) in the brain. Although studying nAChRs provides an understanding of the direct actions of nicotine, it does not provide a comprehensive understanding of all the mechanisms involved in nicotine addiction. Therefore, there is an urgent need to expand our understanding of nicotine's effects on the brain by assessing endogenous proteins that may mediate these processes as well. The endogenous protein, Lynx1, is an exciting candidate since it is co-expressed and directly interacts with nAChRs. **Methods:** To establish whether constitutive Lynx1 knockout alters the expression of associated proteins, we first examined baseline nAChR subunit expression using RT-qPCR. Thereafter, male and female Lynx1 knockout mice and their wildtype littermates were examined for food self-administration to determine if there are differences in their ability to press a lever associated with reward. Following food self-administration, mice were then implanted with a catheter into their jugular vein and examined for intravenous nicotine self-administration across low, moderate, and high doses of nicotine. **Results and Conclusions:** We found that global knockout of Lynx1 increases nicotine self-administration at low, rewarding doses with a sex-specific effect. Importantly, since there were no differences in baseline mRNA expression of nAChR subunits, the effects could specifically be attributed to the absence of Lynx1. Moreover, given that the mice were able to establish food training similar to wildtype animals, the effects found with intravenous self-administration were specifically due to nicotine infusions at the lower doses. These findings demonstrate that endogenous modulators play a key role in nicotine reinforcement, which may lead to novel therapeutic development for tobacco cessation. Research supported by NIH NIDA R00 DA032543 (CDF), TRDRP High Impact Pilot Award T30PI0931 (CDF), and NIH NIDA F31 DA050436 (YS).

FUNDING: Federal; State

POD29-2

A NOVEL METABOTROPIC GLUTAMATE RECEPTOR 2 POSITIVE ALLOSTERIC MODULATOR, SBP-1315, ATTENUATES NICOTINE TAKING AND NICOTINE SEEKING IN RATS

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Glutamate neurotransmission plays an important role in addiction to nicotine and other drugs. We and others have demonstrated that activation of metabotropic glutamate subtype 2 (mGlu₂) receptors inhibit nicotine taking and nicotine seeking behaviors in rodents. The present study describes the novel selective mGlu₂ receptor positive allosteric modulator (PAM), SBP-1315, and its assessment in rat models of nicotine reward and reinstatement. *In vitro* studies demonstrated that SBP-1315 is a potent and selective mGlu₂ receptor PAM. This compound exhibits drug-like pharmacokinetic properties in rats including excellent oral bioavailability, long half-life and acceptable brain penetration. Acute or chronic treatment of rats with SBP-1315 (40 mg/kg, *qd, po*) significantly decreased intravenous nicotine, but not food, self-administration. SBP-1315 also significantly attenuated cue-induced reinstatement of nicotine-seeking behavior in rats. Our studies indicate that SBP-1315 attenuates the reinforcing effects of nicotine and the motivational impact of cues that were previously associated with nicotine administration in rats. The present results provide further evidence that mGlu₂ receptor PAMs may be useful in the treatment of nicotine dependence in humans.

FUNDING: Federal

POD29-3

GPR3 AS A NOVEL THERAPEUTIC TARGET FOR NICOTINE ADDICTION

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Significance: Although many individuals express a desire to quit tobacco smoking, currently available therapeutics have proven to be only moderately efficacious, and with the recent emergence of e-cigarettes, a new generation of individuals are developing symptoms of addiction. Thus, a pressing need exists for target identification and validation to derive novel therapeutics. We have previously shown that the projection from the medial habenula to the interpeduncular nucleus attenuates nicotine reinforcement, and thus, selective modulation of this brain pathway may provide an innovative therapeutic approach. Thus, the current studies sought to validate whether the orphan G-protein coupled receptor GPR3, which is expressed selectively in the medial habenula, can alter nicotine intake in a mouse model. **Methods:** Adult, male C57BL6/J mice were assessed in the intravenous nicotine self-administration protocol. After establishing consistent responding for nicotine, mice were administered the GPR3 agonist, EGBB-158, in a Latin-square design across sessions. EGBB-158 was also examined for its effects on operant responding for food reward and locomotor activity in the open field. **Results:** We found that administration of the GPR3 agonist, EGBB-158, attenuated nicotine intake in the intravenous nicotine self-administration procedure. Interestingly, a higher dose of EGBB-158 also decreased food self-administration, suggesting that EGBB-158 may additionally serve as a potential therapeutic to decrease food consumption. Administration of EGBB-158 did not alter locomotion, providing evidence that the effects were not due to generalized behavioral inhibition. **Conclusion:** Taken together, these studies establish GPR3 as a novel, promising target for nicotine dependence. Supported by the National Institute on Drug Abuse (NIH DA039658 to CDF)

FUNDING: Federal

POD29-4

MONOACYLGLYCEROL LIPASE IS A POSSIBLE TARGET FOR NICOTINE DEPENDENCE: ANIMAL AND HUMAN GENETIC 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 JZL 184 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.

FUNDING: Federal



POD29-5**ASSOCIATION OF CYP2A6 ACTIVITY AND NICOTINE REINFORCEMENT IN DAILY SMOKERS**

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Significance: Previous research suggests nicotine dependence, cigarette consumption and smoking abstinence outcomes are associated with variation in activity of CYP2A6, the primary enzyme responsible for nicotine metabolism. However, mechanisms explaining these associations are not fully understood. Here we investigated the impact of CYP2A6 activity on nicotine reinforcement and tobacco cue-reactivity, behavioural mechanisms that could potentially explain these previous findings. **Methods:** CYP2A6 activity was indexed genetically in 104 daily cigarette smokers using three approaches. First, smokers were stratified by the presence or absence of reduced/loss of function CYP2A6 gene variants (normal vs. reduced metabolizers). As the nicotine metabolite ratio (NMR) is a reliable biomarker of CYP2A6 activity, our second and third approaches used additional genetic variants identified in genome-wide association studies of the NMR to create a weighted genetic risk score (wGRS) to stratify smokers (fast vs. slow metabolizers) and to calculate a wGRS-derived NMR. Smokers completed forced-choice and cue-reactivity tasks assessing nicotine reinforcement and tobacco cue-induced craving, respectively. **Results:** Controlling for race and sex, normal metabolizers (vs. reduced metabolizers) selected more nicotine-containing (vs. denicotinized) puffs on the forced-choice task ($p=0.031$). In confirmatory analyses, wGRS-based stratification (fast vs. slow metabolizers) produced similar findings. Additionally, our wGRS-derived NMR, which correlated with actual NMR assessed in a subset of participants ($n=55$), was positively associated with the proportion of nicotine-containing cigarette puffs controlling for race and sex ($p=0.015$). None of the CYP2A6 activity indices were associated with tobacco cue-reactivity. **Conclusions:** The findings suggest smokers with high CYP2A6 activity exhibit increased nicotine reinforcement, which may contribute to heavier smoking and poorer cessation outcomes previously reported in faster metabolizers of nicotine. The findings support using CYP2A6 activity, either targeting it therapeutically or in precision medicine, for tobacco use disorder treatment.

FUNDING: Federal; Pharmaceutical Industry; Academic Institution



PODIUM PRESENTATION 8

PAPER SESSION 30: BANNING MENTHOL IN CIGARETTES

POD30-1

CHANGES IN RETAIL SALES OF TOBACCO PRODUCTS IN ONTARIO AFTER A MENTHOL SALES RESTRICTION

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BACKGROUND: The Canadian province of Ontario prohibited menthol tobacco product sales as of January 1, 2017. We assessed the law's impact on retail sales of all cigarettes, menthol cigarettes, menthol capsule cigarettes, non-menthol cigarettes, all cigarettes with menthol-suggestive descriptors, and e-cigarettes. **METHODS:** We licensed customized Universal Product Code-level retail scanner data from The Nielsen Company for tobacco product sales in Ontario and British Columbia (BC), a comparison province with no menthol tobacco policy at that time. Cigar sales were not available. We measured changes in per capita sales from pre- (January-June 2016) to post-policy (January-June 2017) periods. Classification of cigarettes as menthol or non-menthol, or having menthol-suggestive descriptors (including "green," "blue," "silver," and "fresh"), was based on scanner data. **RESULTS:** Menthol cigarette sales decreased 93% pre- to post-policy in Ontario, from 596 to 40 packs per 1,000 people (per capita), compared with a 2% decrease (696 to 679 packs per capita) in BC. Menthol capsule cigarette sales remained low in Ontario pre- to post-policy (<1% of total cigarette sales), but rose six-fold in BC during that period. Product substitution was minimal; non-menthol cigarette sales increased 0.4% in Ontario (11,470 to 11,519 packs per capita), while e-cigarette sales decreased. However, Ontario had a greater increase in sales of cigarettes with menthol-suggestive descriptors (11% increase) than BC (3% increase). In Ontario, nearly all (>99%) pre-policy sales of cigarettes with "green" menthol-suggestive descriptors were menthol cigarettes, but post-policy, 94% of "green" cigarettes sold were non-menthol. **CONCLUSIONS:** Implementation of Ontario's menthol policy was associated with a decrease in retail sales of menthol cigarettes, with little evidence of product substitution. Divergent patterns of capsule cigarette sales in the study provinces suggest that the Ontario policy may have also prevented the surge of capsule cigarette sales seen in BC. The increase in sales of cigarettes with menthol-suggestive descriptors after Ontario's policy implementation warrants further investigation.

FUNDING: Federal

POD30-2

HOW DO MENTHOL CIGARETTE SMOKERS CHOOSE THEIR CIGARETTES AFTER A MENTHOL BAN

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INTRODUCTION: Menthol cigarettes are banned in Ontario, Canada. Some pre-ban menthol smokers continue to smoke cigarettes after the menthol ban. This study used concept mapping to examine factors that influenced menthol smokers' choice of cigarettes after a menthol ban. **METHODS:** In 2020, current cigarette smokers from Ontario who reported menthol cigarette smoking before the menthol ban (n=68; 53.2% women; mean age=45.4, SD=11.6) brainstormed statements that completed the prompt: "After menthol cigarettes were no longer sold in Ontario, how did you choose your current cigarettes, what is something that influenced you or helped you to choose your current cigarettes, or what is a reason you chose the cigarettes you smoke now?" Participants sorted a final list of 68 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:** Nine clusters were identified and grouped into three categories: influences, product characteristics, and behaviors. Clusters relating to influences included Price (lower priced cigarettes preferred), Availability (cigarettes easy to obtain), and Social Influences (getting opinions

from others). Product characteristics clusters included Sensory Appeals (smell, taste, intensity, lightness, harshness), Cigarette Design Characteristics (length, filter, size), and Visual Appeals (packaging, branding). Clusters relating to behaviors included Smoke Usual Non-Menthol Cigarettes (some smoked menthol and non-menthol cigarettes before ban), Search for Menthol Taste (seeking cigarettes that taste like or were marketed as similar to menthol), and Purchase from Alternative Sources (travel to locations where menthol cigarettes are still sold). Price, Sensory Appeals, and Availability were the highest rated clusters. **CONCLUSIONS:** Menthol cigarette smokers' choices of cigarettes after a menthol ban are influenced heavily by product characteristics promoted by the tobacco industry. Policies related to price, marketing, and product availability may improve effectiveness of menthol bans.

FUNDING: Federal

POD30-3

MARKET AREA TRENDS IN MENTHOL AND NON-MENTHOL CIGARETTE SALES IN THE UNITED STATES AND ASSOCIATIONS WITH REGIONAL RACIAL COMPOSITION

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SIGNIFICANCE: Use of menthol cigarettes among smokers in the United States (US) is strongly associated with race. Driven by decades of targeted marketing, approximately 85% of Black smokers use menthol cigarettes; conversely, over 70% of white smokers prefer non-menthol styles. This study uses regional sales data to examine longitudinal changes in menthol and non-menthol cigarette sales and associations with regional racial composition. **METHODS:** Using Nielsen's convenience store sales data from 30 US market areas, we computed the percent change in per capita menthol and non-menthol cigarette sales between 2016-2018. Demographic characteristics of counties comprising each region were compiled from the US Census Bureau. Correlation analyses assessed the relationship between consumption changes and regional racial composition, including the dissimilarity index to measure the spatial distribution of Black-white residential segregation. **RESULTS:** On average, menthol cigarettes held a third of the market share across regions (range: 22-49%); market share was highly correlated with the percent of Black residents (r=0.69). Between 2016-2018, the rate of decline in per capita pack sales was slower for menthol (-8%) versus non-menthol (-11%) cigarettes. No demographic factors were associated with the decline in menthol sales, but the dissimilarity index was negatively correlated with non-menthol sales (r=-0.44, p=0.02). That is, the greater a region's Black-white residential segregation, the faster the decline in non-menthol sales. **CONCLUSION:** Given that over 80% of non-menthol smokers are white, it is plausible that this group is driving changes in non-menthol consumption. This study suggests that beyond regional racial composition, however, greater residential segregation between Black and white residents is related to declines in non-menthol cigarette sales. Future research should examine individual and structural factors at the local level (e.g., retail marketing, unequal policy impact, treatment access) to identify possible mechanisms of this relationship.

FUNDING: Federal

POD30-4

TRANSITIONS BETWEEN CIGARETTE, ENDS, AND DUAL USE DIFFER BY MENTHOL STATUS OF REGULAR CIGARETTE BRAND

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Significance: Menthol and non-menthol cigarettes have different sociodemographic patterns of use. It is not known how menthol cigarette flavoring impacts initiation of electronic nicotine delivery system (ENDS) use and other transitions between patterns of use. **Methods:** We applied a multistate transition model to data on adults from Waves 1-4 (2013-17) of the Population Assessment of Tobacco Health (PATH) study, accounting for complex survey design. We estimated transition rates between never, non-current

**PAPER SESSION 31: MORE THAN JUST WATER: HOOKAHS AND WATERPIPES****POD31-1****DATABASE AND GC-MS ANALYSIS OF THE MOST PREVALENT FLAVORS OF WATERPIPE TOBACCO, HERBAL MOLASSES AND STEAM STONES ON THE DUTCH MARKET**

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Significance: The high variety of fruity and sweet flavors strongly contributes to popularity of the waterpipe among youth. Different waterpipe products exist: from tobacco- or herbal based molasses to stones, liquids or powders. Tobacco-free products can also be sold with added nicotine. The EU Common Entry Gate (EU-CEG) system is a database where companies producing or importing tobacco products or e-cigarettes/liquids provide data of these products to the government. In order to get a clear overview of waterpipe tobacco products, we chose the EU-CEG database as a starting point for the design of a waterpipe flavor wheel and chemical analysis. **Method:** In 2019, 249 different waterpipe tobacco products were registered in the Dutch EU-CEG system. These products were manually categorized based on their marketing descriptions into different flavor categories. Of the 249 products, 237 (95 %) could be classified into a flavor category and a flavor wheel was designed. **Results:** The flavor wheel contains 7 main categories (beverages, candy, flower, fruit, mint, spices and sweets) and 47 subcategories. Fruit is the most prevalent flavor category, covering 78 % (N = 185) of all the categorized products. The most prevalent subcategories (min 10 products) are: blueberry, apple, strawberry, grape, bubble gum, watermelon, lemon and mint. The top ten most prevalent flavoring ingredients are: vanillin, ethyl vanillin, dihydrocoumarin, ethyl butyrate, ethyl acetate, ethyl-2-methylbutyrate, maltol, isamyl acetate, menthol and benzyl alcohol. Data will be shown on GC-MS quantification of the most common flavoring ingredients and nicotine in a selection of waterpipe products and their emissions. **Conclusion:** The waterpipe tobacco flavor wheel provides a guideline for communication and comparability between studies. Furthermore, cigarettes containing characterizing flavors other than tobacco have been banned in the EU and USA. Recently, non-tobacco flavors have also been banned for e-cigarettes in The Netherlands. Since waterpipe products typically contain fruity and sweet flavors, they might be taken into consideration for such a ban in order to discourage waterpipe smoking among youth.

FUNDING: Federal

POD31-2**WATERPIPE TOBACCO AND CIGARETTE CONSUMPTION DEMAND ELASTICITIES IN LEBANON, JORDAN AND WEST BANK, PALESTINE**

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SIGNIFICANCE Waterpipe tobacco smoking is a traditional tobacco use method that originated in the Eastern Mediterranean Region and has had a global resurgence in recent years. Waterpipe smoking rates in the region are among the highest worldwide, yet its economics is little understood. Available estimates of adult demand elasticities are mostly limited to cigarette smoking. This study aimed to estimate the demand elasticities of waterpipe products in Lebanon, Jordan and Palestine. **METHODS** Nationally representative household surveys of adults were conducted in each of the three countries. The surveys included a volumetric choice experiment that elicited respondents' stated preferences for purchasing 8 different cigarette and waterpipe products with 4 hypothetically varied price levels. Data were analyzed using zero-inflated Poisson models. **RESULTS** The samples included 1680 participants in Lebanon (50% female), 1925 in Jordan (44.6% female), and 1679 in Palestine (50% female). The mean age was approximately 40 years across all countries. Participants in Lebanon stated the largest quantities across all products, compared to their counterparts in Jordan and Palestine. Elasticities for Lebanon ranged between -1.87 for home-delivered water-

(i.e., at least 30-day abstinence), non-menthol vs. menthol cigarette, ENDS, and dual use states. We estimated hazard ratios (HR) by sociodemographic group overall and stratified by race/ethnicity. Results: Menthol cigarette users were no more likely than non-menthol users to also start ENDS use (HR 1.1; 95%CI: 0.9-1.3) and were slightly less likely to discontinue cigarette use than non-menthol users (HR 0.9; 95%CI: 0.7-1.0). Menthol cigarette users were more likely to switch to non-menthol use than the reverse (HR 1.6; 95%CI: 1.3-2.0); the transition from menthol to non-menthol cigarette use was more likely for younger than older adults (HR 2.1; 95%CI: 1.6-2.8). Sociodemographic transition patterns were different for menthol and non-menthol cigarette users, e.g., younger Non-Hispanic White (NHW) adults were much more likely to initiate menthol cigarettes than older adults but no more likely to initiate non-menthol cigarettes. Menthol cigarette use among NHB users was more persistent (85% in one wave) than either type of cigarette use among NHWs (83% non-menthol, 78% menthol), while non-menthol cigarette use was less persistent (56%). Compared to NHWs, NHBs were more likely to initiate menthol cigarette use (HR 7.1; 95%CI: 5.0-10.1), less likely to discontinue menthol cigarette use (HR 0.7; 95%CI: 0.5-0.9), and considerably less likely to dual use ENDS and menthol cigarettes (HR 0.2; 95%CI: 0.2-0.3). Conclusions: Menthol may be a gateway for young adult cigarette use. NHB adults have higher rates of menthol smoking, which is associated with slightly lower rates of discontinuation, and have lower rates of ENDS adoption. These patterns could lead to differential impacts of a cigarette menthol ban on smoking rates.

FUNDING: Federal

POD30-5**THE RELATIONSHIP BETWEEN MENTHOL CIGARETTE USE, SMOKING CESSATION AND RELAPSE- FINDINGS FROM WAVES 1 TO 4 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY**

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Significance: Some, but not all, studies suggest that menthol cigarette smokers have more difficulty quitting than non-menthol cigarette smokers. Inconsistent findings may be a result of differences in participant smoker characteristics (e.g., daily vs. non-daily smokers) across studies. This study examines the relationship between menthol cigarette use, cessation and relapse in a longitudinal, nationally representative study of tobacco use in the United States. **Methods:** Data come from four waves of the Population Assessment of Tobacco and Health Study. Waves 1-4 were conducted approximately annually from September 2013 to January 2018. Generalized estimating equation models were used to prospectively examine the relationship between menthol cigarette use, cessation, and relapse in non-daily and daily adult (18+ years) smokers. **Results:** Among daily smokers ($n = 13,710$), 4.0% and 5.3% of menthol and non-menthol cigarette smokers quit after one year, respectively. In adjusted models, daily menthol cigarette smokers were less likely to have quit compared to daily non-menthol cigarette smokers (OR=0.76 [0.63, 0.91]). When the sample was stratified by race/ethnicity, African-American (OR=0.47 [0.24, 0.91]) and White (OR=0.78 [0.63, 0.97]) daily menthol cigarette smokers were less likely to have quit, but there was no significant relationship between menthol cigarette use and quitting among daily smokers who identified as Other or Hispanic. Among non-daily smokers ($n = 3,608$), there were no significant ($p > .05$) differences in quit rates between menthol and non-menthol cigarette smokers in the total sample or in models stratified by race/ethnicity. Among daily and non-daily former smokers, there were also no significant differences in relapse rates between menthol and non-menthol cigarette users. **Conclusions:** Findings suggest that menthol cigarette use is associated with lower odds of quitting, but menthol cigarette use is not associated with greater likelihood of relapse. Removing menthol cigarettes from the market may improve cessation rates.

FUNDING: Federal



pipe and -2.31 for waterpipe consumed in premium cafes. Elasticities in Jordan for waterpipe products ranged between -0.34 for waterpipe in a discount café to -0.86 for discount waterpipe smoked in the home, while the elasticity for home-delivered waterpipe was insignificant and that for traditional waterpipe tobacco positive (0.81). Finally, elasticities in Palestine were only highly significant for waterpipe in premium cafes (-1.16). **CONCLUSION** Though sharing cultural similarities, demand elasticities differed substantially across Lebanon, Jordan and Palestine. Lebanon had the highest elasticities across waterpipe products, likely due to its higher consumption levels and a reflection of a higher price sensitivity resulting from its current economic crisis. These results provide a strong evidence base for developing fiscal policies for the control of waterpipe tobacco use in the region.

FUNDING: Other

POD31-3

MARKERS OF OXIDATIVE STRESS AMONG YOUNG WATERPIPE SMOKERS IN THE UNITED STATES

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Significance: Waterpipe tobacco smokers are exposed to toxicants that can lead to oxidative DNA and RNA damage, a precursor to chronic disease formation. This study assessed biomarkers of DNA [8-oxo-7, 8-dihydro-2'-deoxyguanosine (8-oxodG)] and RNA [8-oxo-7,8-dihydroguanosine (8-oxoGuo)] oxidation and the effect of flavored and non-flavored waterpipe tobacco smoking (WTS) on their urinary concentrations. **Methods:** Thirty past-month (smoked at least once in past 30 days) waterpipe smokers aged 18-30 years were recruited from the metropolitan area surrounding Miami, Florida, via flyers, word of mouth, and online advertisements (e.g., Craigslist). All participants completed two counterbalanced 2-hour lab visits that included waterpipe smoking sessions (flavored vs. non-flavored waterpipe tobacco). Urinary concentrations of 8-oxodG and 8-oxoGuo were measured before and after the smoking sessions. Planned comparisons using two-tailed paired t-tests were used to examine outcome mean differences between time points (pre vs. post), PROC MIXED in SAS/STAT v 9.4 for continuous outcomes was used to examine mean differences of 8-oxodG and 8-oxoGuo between sessions (flavored vs. non-flavored) and within individuals to account for repeated measures. **Results:** Participants were mostly Hispanics (53.3%), with a mean age of 21.4 ± 2.8 years and included 53.5% males. Participants reported smoking an average of 5.3±4.8 waterpipes per month. Around 66.7% reported that the average time spent smoking waterpipe was 30-60 minutes. More than half of the participants (56.7%) reported smoking waterpipe at a public place, and 83.3% reported that they used to share waterpipe with others. The results showed that the urinary concentration of 8-oxodG increased significantly after smoking the non-flavored waterpipe tobacco ($p=0.024$). We also found that the urinary concentration of 8-oxoGuo increased significantly after smoking flavored waterpipe tobacco ($p = 0.003$). There were no significant differences in the mean of 8-oxodG ($p=0.576$) and 8-oxoGuo ($p = 0.108$) between the flavored and non-flavored tobacco sessions. **Conclusion:** The higher concentrations of 8-oxodG and 8-oxoGuo observed after smoking waterpipe are clear indicators of WTS ability to induce oxidative damage to DNA and RNA, which is implicated in the pathogenesis of a wide variety of diseases including lung cancer. Our findings add to the existing evidence about the adverse effects of WTS and the need for strong policies to inform and protect young people from the risks of WTS.

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POD31-4

HEALTH WARNING LABELS ON WATERPIPES: PLACEMENT LOCATION AND HEALTH RISK PERCEPTIONS

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Significance: Health warning labels (HWLs) on tobacco products perform several key functions to better inform users about health risks of use: they increase awareness of health risks, support cessation, and deter initiation of use. The goal of this study was to select a health warning message location on a waterpipe (WP) that both attracted visual attention and conveyed the risks associated with WP smoking. **Methods:** During

June through November 2019, a within-subjects randomized experiment ($n=74$) was conducted using eye tracking equipment to examine visual attention to 3 placements of a health warning on the WP (stem, water bowl, hose). Young adult participants were asked 3 questions about WP harm perceptions and how often the warnings encouraged thoughts of health risks. Generalized linear mixed models were used to examine the amount of fixation time spent on the placement locations, and repeated measures ANOVA was used to model changes in harm perceptions. **Results:** There were statistically significant differences across all 3 placement locations; regardless of place, all HWLs attracted a comparable amount of visual attention. All participants endorsed that the warning labels made them think about the risks of WP use in the previous week; 23% rated as "extremely" for the extent the warnings made them think about the health risks of WP use. Absolute WP harm perceptions significantly increased following the experiment and remained significantly higher at the one-week follow-up, compared to baseline. **Conclusion:** Warnings on WPs attracted visual attention and increased harm perceptions, and those harm perceptions remained high one week after the experiment. Paying attention to a HWL is a key first step needed for an individual to recall the health warning messages, comprehend it, and subsequently inform decisions to change behavior. Our findings indicate the value of including a warning on the WP device, and underscore the necessity and effectiveness of those health warnings to combat WP harm misperceptions.

FUNDING: Federal

POD31-5

ESTIMATION OF THE AGE OF FIRST REPORT OF HOOKAH USE AMONG ADOLESCENTS IN THE USA USING THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVES 1-4 (2013-2017)

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Objective: Hookah has been associated with negative health effects such as increased risk of leukemia, gastric cancer, and cardiovascular impairments. There also has been a significant increase in hookah use among youth from 2010-2014. Still, we do not have a good picture of the age of initiation of hookah use in youth. This study reports the prospectively estimated age of initiation of susceptibility to, ever, past 30-day, and fairly regular hookah use in youth (12-17). **Methods:** Secondary data analyses of the first four waves (2013-2017) of the PATH study, a nationally representative longitudinal cohort study of US youth (ages 12-17) were conducted. Youth never hookah users at their first wave of participation in PATH waves 1-3 (2013-2016) were followed-up into waves 2-4 (2014-2017) to estimate the age of onset of four outcomes: (i) susceptibility to, (ii) ever, (iii) past 30-day, and (iv) fairly regular hookah use. Weighted interval-censored survival methods and interval-censored Cox regression models were implemented to estimate the age of first report of each hookah use outcome and to estimate differences in the hazard function by sex and race/ethnicity. **Results:** By age 13, 10.9% of youth were susceptible to hookah use, and 0.6%, 0.2%, and 0.1% of youth reported initiation of ever, past 30-day, and fairly regular hookah use. By age 18, 51.3% of youth were susceptible to hookah use, and 19.7%, 9.7%, and 1.8% reported initiation of ever, past 30-day, and fairly regular hookah use. Female and Hispanic youth were at a higher risk of becoming susceptible to hookah use and becoming ever hookah users at earlier ages than male or non-Hispanic White youth. **Conclusion:** Education and intervention campaigns are needed to prevent youth from hookah use, certainly before early adolescence. It may be necessary to implement education and intervention programs earlier for female and Hispanic youth as they are at a higher risk of becoming susceptible to hookah use and initiating ever hookah use at early ages.

FUNDING: Federal



PAPER SESSION 32: THE ENDURING CHALLENGES OF POLY-SUBSTANCE USE FOR TOBACCO CESSATION

POD32-1

CORRELATES OF DUAL USE OF CIGARETTES AND E-CIGARETTES AMONG INDIVIDUALS WITH SUBSTANCE USE DISORDER LATENT CLASS ANALYSIS USING LONGITUDINAL DATA

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Introduction While cigarette smoking has remained highly prevalent among individuals with substance use disorders (SUDs), e-cigarettes recently gained popularity among all populations, including this vulnerable group. Continued tobacco use is associated with interference with SUD recovery and increased risk of relapse for individuals with SUDs. Information is needed regarding dual use of cigarettes and e-cigarettes among this population. **Methods** Individuals being treated at a southeastern substance use disorder treatment center were invited to share information from their medical record for research purposes. We extracted results of longitudinal assessments that were completed at baseline and after 30 days of treatment. The sample (N=416; Age Mean=40.1) was 62.5% male and 93.5% Caucasian. We used latent class analysis using past-30-days use of cigarettes and e-cigarettes at baseline and 30-days. **Results** We identified four distinct class memberships: (1) "non-users" (n=169; 39.1%); (2) "cigarette smokers" (n=139; 33.8%); (3) "dual users of cigarettes and e-cigarettes" (n=63; 16.3%); and (4) "e-cigarette users" (n=45; 10.8%). Older patients were less likely to be in the "e-cigarette users" (aOR=0.91), "dual users" (aOR=0.89), and "cigarette smokers" (aOR=0.96) classes than the "non-users" class. Higher education level (aOR=0.83) and higher level of general self-efficacy (aOR=0.94) were associated with a lower likelihood of being in the "cigarette smokers" class. Those who had previous SUD treatment were more likely to be in the class of "dual users" (aOR=2.87), and increased anxiety symptoms predicted a higher odds of being in classes of "e-cigarette users" (aOR=4.74) and "dual users" (aOR=4.24) (All *ps* <0.05). **Discussion** This study highlighted demographic, clinical, and psychosocial correlates of cigarette and e-cigarette use patterns among individuals in treatment for SUD. Given the growing public health concern regarding the negative health impact of e-cigarette use and the potential use of e-cigarette devices to administer other drugs (e.g., opioids), more research is needed in this area. Cessation interventions for e-cigarette users should target younger individuals, teach healthy coping and emotional management skills, and focus on improving self-efficacy to have maximal impact. **Funding** This research was supported by the Pottash Professorship in Psychiatry and Neuroscience and the University of Florida Clinical and Translational Science Institute (UL1TR001427).

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POD32-2

POWER TO QUIT 2 RESULTS FROM A SMOKING AND ALCOHOL CESSATION INTERVENTION IN THE HOMELESS POPULATION

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Background In the United States, 80% of the adult homeless population smokes cigarettes compared to 15% of the general population. Power to Quit 2 (PTQ2), a randomized clinical trial that tested the efficacy of a bio-behavioral intervention compared to usual care. Our primary hypothesis was that at 26 weeks post randomization, homeless smokers who receive a smoking cessation and alcohol abstinence intervention would have significantly higher biochemically-verified 7-day abstinence rate from cigarette smoking compared to those who received usual care. Our secondary hypothesis was that 26 weeks follow up the intervention group, compared to usual care, would have significantly higher 30-day alcohol abstinence. **Methods** PTQ2 was implemented in two urban homeless shelters in the Upper Midwest. 352 participants were randomized to either the treatment arm, receiving 10 sessions of cognitive behavioral therapy for smoking and

alcohol cessation and NRT (n=172), or usual care arm (n=180), who received a single educational session on smoking and alcohol cessation, and NRT. The primary analysis compared the CO-verified 7-day abstinence from cigarette smoking between the intervention and usual care groups. **Results** At 26 weeks follow up, 16.3% of participants in the treatment arm reported being abstinent from smoking. The usual care group had a 12.6% smoking cessation rate (p=0.46). Self-reported 30-day abstinence from alcohol at Week 26, reported as % days abstinent was 91.4 for the treatment group, and 89.5 in the usual care group (p=0.49). **Conclusion** This study showed that a combined smoking and alcohol intervention did not result in a significantly higher smoking or alcohol cessation rates compared to usual care. Smoking and alcohol cessation rates in both study conditions were higher than in the general homeless population. Future research should focus on the increased optimization of smoking cessation interventions in this high-risk population.

FUNDING: Federal

POD32-3

SMOKING CESSATION AMONG QUITLINE CALLERS WHO USE CANNABIS AND OR ALCOHOL RESULTS FROM THE NY QUITLINE 7 MONTH FOLLOWUP ASSESSMENT

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Significance: Cannabis and/or alcohol use problems impede one's ability to successfully abstain from cigarettes, but the combined effects of using these substances has not been examined. We examined prospective quit rates among Quitline callers according to their monthly cannabis and/or alcohol use at intake. **Methods:** Data were analyzed from 2,601 adult tobacco users who called the New York State Smokers Quitline from 2018-2020 for cessation assistance, and responded to a follow-up survey 7 months after intake. Demographics, past month frequency of cannabis and alcohol use, and tobacco use were collected at intake. Abstinence was assessed with 7-month, 7-day point prevalence. Binary logistic regression modelling was used to estimate treatment outcomes among adults who individually or concurrently used cannabis and/or alcohol compared with non-users. Continuous measures of monthly cannabis and alcohol use were used to test for interaction between monthly substance use frequency at intake and odds of quitting at follow-up. **Results:** At intake, most smokers (69.8%) reported no past month use of cannabis or alcohol, while 22.2% only used alcohol, 4.2% only used cannabis, and 3.8% used both. At follow-up, 34.8% of non-users, 39.1% of alcohol-only users, 29.4% of cannabis-only users, and 32.3% of co-users reported smoking abstinence. Compared to non-users, those who used cannabis 20-30 days/past month had significantly lower odds of quitting at follow-up (aOR: 0.58, 95%CI:0.34-0.98). Interaction analyses suggested smokers who used cannabis 20-30 days/past month had diminished odds of quitting with greater monthly frequency (20+ days) of alcohol use; these differences were not statistically significant. **Conclusions:** Almost one-third of NY Quitline callers used cannabis and/or alcohol within the past month, either individually or concurrently. Daily or near daily cannabis use was associated with reduced odds of being quit at follow-up, and more frequent monthly alcohol use may compound difficulty in quitting among frequent cannabis consumers. Individual and concurrent use of these substances merit continued monitoring in the context of tobacco cessation treatment.

FUNDING: State

POD32-4

MARIJUANA CESSATION ATTEMPT IMPACT ON TOBACCO USE AND TOBACCO URGES IN CO-USERS OF MARIJUANA AND TOBACCO

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Significance: Prior research indicates co-users of marijuana and tobacco have increased nicotine dependence and difficulty abstaining from nicotine. It remains unclear how co-users may change their patterns of tobacco use during a cessation attempt. This study aims to examine tobacco use and tobacco urges during a marijuana cessation attempt. We hypothesized tobacco use will increase with marijuana cessation and as a result tobacco urges will decrease. **Methods:** Data was obtained from a parent study which randomized participants to exogenous progesterone or placebo as a marijuana



cessation or reduction aid in co-users. Linear mixed effect models were used to estimate the associations between marijuana cessation and changes from baseline in tobacco use and Questionnaire of Smoking Urges (QSU) scores. **Results:** Of the 45 participants included in this analysis, 80% were male and 48% were Black or African American with a mean age of 39 years old. 33% (n=15) had no successful marijuana cessation attempts, 22% (n=10) were mostly successful, and 44% (n=20) had some success. Successful participants were less likely to be daily marijuana users and had lower marijuana dependence. On average, successful cessation participants smoked an average of 3.19 fewer CPD (95% confidence interval [CI]: 1.32-5.05 fewer CPD) and scored 6.85 points lower (95% CI: 2.95-10.76 points lower) on QSU from baseline compared to 3.05 fewer CPD (95% CI: 1.26-4.84 fewer CPD) and a decrease of 7.81 points (95% CI: 4.10-11.53 points lower) on QSU from baseline for non-successful cessation participants. There was no statistical difference between successful and non-successful marijuana cessation attempts regarding cigarettes smoked per day or QSU scores. **Conclusions:** Contrary to our hypothesis, marijuana cessation attempts decreased both tobacco use and tobacco urges regardless of success in marijuana cessation. The lack of substitution of tobacco during marijuana cessation is consistent with prior studies. Perhaps most surprisingly, diminished tobacco use was associated with decreased tobacco urges. Further analysis should investigate whether motivation to quit tobacco played a role in this finding.

FUNDING: Federal

PAPER SESSION 33: SMOKING, VAPING AND PLACE

POD33-1

BAR ATMOSPHERICS AND SMOKING: A QUALITATIVE ANALYSIS OF YOUNG ADULT SMOKERS

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SIGNIFICANCE: Smoking among young adults often occurs in social contexts and in tandem with alcohol use. While many countries have prohibited smoking inside licensed premises, design attributes (“atmospherics”) of outdoor areas enable smoking and alcohol co-use to persist. We examined whether and how bar atmospherics facilitate and normalise young adult smoking. **METHODS:** We conducted in-depth interviews with 22 young adults (ages 20-26; eight male) who had recently smoked in a New Zealand bar or nightclub. The interviews explored participants’ perceptions of physical design attributes and explored how these features influenced experiences of smoking in outside bar settings. We used qualitative description to identify recurring accounts of the outdoor bar environment and thematic analysis to explore how participants experienced bar atmospherics in relation to smoking. **RESULTS:** Attributes such as seating, tables, heating, protection from inclement weather, and minimal crowding helped create hospitable, comfortable and relaxing spaces. Three themes explained how exterior atmospherics cued smoking and provided psycho-social benefits and the fourth outlined possible regulatory responses. Outdoor areas provided respite from intense indoor settings and functioned as key settings where participants strengthened and established social connections. Design attributes signaled smoking’s acceptability in these areas; smokers felt welcomed as valued members of the bar ecosystem, which reduced the stigma of smoking they experienced in other settings. Understanding the importance of atmospherics informed the final theme, which identified potential policy measures that would decouple smoking and alcohol co-use. **CONCLUSIONS:** Bar environments contain many stimuli that cue and reinforce smoking; these physical design attributes sanction and facilitate smoking among young people. Introducing more comprehensive smokefree outdoor policies could reduce the influence of design attributes that foster smoking while also reframing smoking as outside normal social practice.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD33-2

WHERE DO PEOPLE SMOKE CIGARETTES?

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Significance: Behavioral smoking cessation interventions emphasize controlling exposure to environments associated with smoking. Policy efforts have also focused on reducing the types of environments in which smoking is permitted. Despite this, there is surprisingly little empirical research on the specific contexts where smoking occurs. This information would have profound implications for laboratory research (e.g. cue reactivity studies), as well as intervention and policy development (e.g. tools for identifying risky contexts, areas where smoking restrictions may be most impactful). **Methods:** Heavy smokers (>10 CPD; N = 52) completed a detailed structured interview that assessed their smoking locations and the typical number of cigarettes smoked in these locations, as well as a two-week ecological momentary assessment (EMA) protocol in which completed brief prompts describing their current location each time they smoked a cigarette. For each participant, we calculated the average proportion of cigarettes smoked in each setting. **Results:** The settings where participants smoked the most cigarettes were inside the home (28.3% of cigarettes), outside their home (26.6%), inside vehicles (17.6%) or at work (15.6%). Within the home, the most common rooms for smoking to occur were the bedroom (18.2%), living room (11.2%) and bathroom (10.7%). EMA results across 4,973 smoking events paralleled these findings, with the most common smoking locations being inside the participant’s home (33.0%), outside their home (27.2%), inside vehicles (15.5%) or at work (8.1%). High agreement was found across response modalities for home and vehicles (r ’s > .5, p ’s < .001), but was weaker for work ($r = .258, p = .087$). **Conclusions:** Together, findings indicate both clinical and policy research should focus on smoking at home, as this is where the majority of cigarettes are smoked. Results also have important implications for cue reactivity research. Contexts commonly used



in these paradigms are not necessarily common smoking locations for all participants. Important future directions include examination of tobacco use contexts among dual users of conventional and electronic cigarettes.

FUNDING: Federal

POD33-3

YOUTH TOBACCO AND MARIJUANA USE AND CO-USE: ASSOCIATIONS WITH DAILY EXPOSURE TO TOBACCO RETAIL MARKETING WITHIN ACTIVITY SPACES AND BY TRAVEL PATTERNS

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Using Geographical Ecological Momentary Assessment data, we investigated youth daily activity spaces, travel patterns, exposure to tobacco retail marketing, and tobacco use, marijuana use and co-use. Data were collected from 101 participants (16-20 years old) in 8 California cities for 14 days (1,483 assessments). Using GPS-enabled smartphones with a survey application, youth responded to brief daily surveys and location coordinates (latitude and longitude) were obtained at one-minute intervals. Tobacco outlets in study cities were visited by observers to record outlet GPS point locations and data concerning tobacco marketing. Tobacco outlet addresses and GPS location coordinates were geocoded. Activity spaces were constructed by joining sequential location points. Measures included the number of outlets that had outdoor tobacco marketing within 50 meters of activity space polylines and the amount of time participants were within 50 meters of these outlets each day. Also, participants reported tobacco and marijuana use and whether they saw any tobacco ads in or by their (1) neighborhood, (2) school, (3) workplace, and (4) anywhere else each day. They also reported each day how much time they traveled from place to place (1) by different modes of transportation (e.g., car), (2) with parents/guardians, and (3) with friends. In multilevel mixed effects multinomial regression models controlling for demographics, perceived exposure to tobacco marketing was associated with co-use of tobacco and marijuana on a given day (RRR=1.67, $p<0.001$). Although perceived exposure to tobacco marketing was not associated with tobacco use only, the proportion of time participants walked/biked/skated within their activity spaces moderated this relationship such that the likelihood of tobacco use was greater among youth who walked/biked/skated more (RRR=4.83, $p<0.05$). Traveling with parents was negatively associated with tobacco use only that day (RRR=0.77, $p<0.05$). Results suggest that perceived, and not objective, exposure to tobacco marketing contributes to youth tobacco and marijuana use or co-use, especially for those who travel by walking/biking/skating.

FUNDING: Federal; State

POD33-4

ASSESSING THE QUALITY OF GOOGLE STREET VIEW FOR DOCUMENTING TOBACCO ADVERTISING IN NEW YORK CITY

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Significance: Google Street View (GSV) is increasingly used to remotely survey neighborhood features known to influence health behavior, such as tobacco retail advertising. Despite the advantages of GSV as a data collection tool, the relative quality of virtual data compared to data collected in-person is unclear, particularly in urban settings. This project explored agreement between GSV and in-person retail audit data for storefront tobacco advertising in Manhattan, New York City. **Methods:** Between July-September 2017, we conducted in-person audits of a random sample of tobacco retailers in Manhattan (n=183). Storefront advertising for cigarettes, cigars, smokeless tobacco, and e-cigarettes was documented and photographed. In 2020, we re-audited the same retailers using GSV (a "history" tool displays street-level imagery for a particular year). Stores were virtually audited if imagery was available within 3 months of the in-person audits and if the storefront was unobstructed. Accuracy metrics (i.e., sensitivity and specificity) were calculated to measure the performance of GSV compared to in-person audits (the "gold standard"). **Results:** Overall, unobstructed GSV images were available for 86.3% (n=158) of storefronts in the original sample. There were notable differences in sensitivity (i.e., the ability of GSV to correctly document the presence of an advertisement) across tobacco products: cigarettes (64.7%), cigars (37.5%), smokeless tobacco (33.3%), and e-cigarettes (47.8%). Specificity (i.e., the ability of GSV to correctly document the absence of an advertisement) was comparable: cigarettes (93.5%), cigars (93%),

smokeless tobacco (97.9%), and e-cigarettes (96.3%). **Conclusion:** In this sample, GSV substantially undercounted tobacco product advertisements, largely driven by low image resolution when zooming in on a storefront photo. Moreover, a considerable number of storefronts were not visible due to obstruction by vehicles, construction, or other fixtures. Although GSV may be a helpful tool to capture tobacco advertising in urban settings when in-person observations are infeasible, the data quality is inferior.

FUNDING: Federal

POD33-5

THE ASSOCIATION BETWEEN STATEWIDE VAPING PREVALENCE AND COVID-19 INFECTIONS

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Background: Existing literature indicated electronic cigarette users (vapers) had impaired immune response that might increase vulnerability to coronavirus disease 2019 (COVID-19) infection and death. However, whether vapers are more susceptible to COVID-19 infection is unknown. **Methods:** Using integrated data in each US state from the 2018 Behavioral Risk Factor Surveillance System (BRFSS), United States Census Bureau and the 1Point3Acres.com website, generalized estimating equation (GEE) models with negative binomial distribution assumption and log link functions were used to examine the association of statewide e-cigarette use prevalence with number of COVID-19 infections and deaths in the US from January 21, 2020 to April 25, 2020. **Results:** The weighted proportion of vapers who used e-cigarettes every day or some days ranged from 2.86% to 6.42% for US states. Statistically significant associations were observed between the weighted proportion of vapers and number of COVID-19 infected cases as well as COVID-19 deaths in the US after adjusting for the weighted proportion of smokers and other significant covariates in the GEE models. With every one percent increase in weighted proportion of vapers in each state, the number of COVID-19 infected cases increase by 0.3139 (95% CI: 0.0554 - 0.5723) and the number of COVID-19 deaths increase by 0.3705 (95% CI: 0.0623 - 0.6786) in log scale in each US state. **Conclusions:** The positive associations between the proportion of vapers and the number of COVID-19 infected cases and deaths in each US state suggest an increased susceptibility of vapers to COVID-19 infections and deaths and warrants further investigation.

FUNDING: Federal



**PAPER SESSION 34: DELIVERY VEHICLES:
OTHER FACTORS AFFECTING DRUG USE**

POD34-1

**THE EFFECTS OF FREE BASE NICOTINE CONCENTRATION
AND SALIVARY PH ON NICOTINE PHARMACOKINETICS OF
SMOKELESS TOBACCO**

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Significance: Nicotine absorption rate and brain delivery influence tobacco products' addictiveness. For smokeless tobacco (ST), nicotine buccal absorption depends on its concentration in free base (FB) form; the equilibrium shift to the FB form depends on pH that may be modified by variations in ST's and saliva's relative pH. This is the first study to compare nicotine buccal absorption among ST products that differ only in FB nicotine concentration with several orders of magnitude range. **Methods:** Moist snuff users (N=40) completed four crossover visits using a single 2g portion of Copenhagen Original Long Cut® (~9.0 mg/g nicotine) for 30 minutes amended to four pH levels of and (% FB nicotine concentration): pH 5.0 (0.3%), pH 7.7 (30%), pH 8.2 (55%), and pH 8.6 (80%). Participants' saliva pH was measured pre and post ST use. Blood draws were collected over four hours, and nicotine pharmacokinetics (PK) were described via a non-compartmental method. Mixed effect models were fit to PK parameters incorporating the crossover design of the study into the analysis. **Results:** The rate and extent of nicotine absorption substantially depends on the FB concentration. With a 100-fold increase of FB nicotine (0.3 to 30%), both mean plasma nicotine C_{max} and AUC₀₋₄ doubled; a 1.8-fold increase of FB nicotine (30 to 50%) led to similar changes in both mean C_{max} and AUC₀₋₄; the 1.45-fold increase of FB nicotine (55 to 86%) led to 10% increase of both mean C_{max} and AUC₀₋₄. From the lowest to highest FB nicotine products, mean plasma nicotine C_{max} and AUC₀₋₄ increased over three-fold (C_{max} 4.7 to 17.1 ng/mL; AUC₀₋₄ 554 to 1810 ng x min/mL, both p<0.001). Neither baseline saliva pH nor its change during ST use significantly altered nicotine PK. **Conclusions:** Nicotine PK were substantially influenced by FB nicotine concentration in ST products, with changes in both rate and extent of its absorption. We found no evidence for an effect of saliva pH on nicotine PK, though that could be confounded by individual use behaviors. The relationship between the FB nicotine concentration of ST products and the resulting nicotine exposure in users may impact the addictiveness of ST products.

FUNDING: Federal

POD34-2

**EFFECT OF FREEBASE AND PROTONATED NICOTINE ON
ELECTRONIC CIGARETTE NICOTINE YIELD**

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Nicotine in electronic cigarette (ECIG) liquids can be found in a freebase or protonated (or "salt") form depending on the pH of the product. Protonated nicotine is less aversive upon inhalation than free-base nicotine, and many ECIG manufacturers have begun marketing products that contain protonated nicotine, often with high nicotine concentrations. These products vary by liquid composition, i.e., propylene glycol to vegetable glycerin (PG/VG) ratio, electrical features, and device design. While ECIG nicotine yield has been shown to increase with PG/VG ratio and power, the influence of form on yield has not been directly examined. This knowledge gap is important because regulations intended to control ECIG nicotine delivery focus exclusively on nicotine concentration, neglecting factors such as form, electrical power, and PG/VG ratio. In this study, we systematically examined the effect of nicotine form on nicotine yield for varying powers and PG/VG ratios. ECIG aerosol were generated using a Kanger Subox Mini-C sub-Ohm device at powers ranging from 5-45W and four different liquid solutions that contained either freebase or protonated nicotine at 15mg/g concentration, with either PG or VG. Puff topography conditions were kept constant at 4sec puff duration, 10sec interpuff interval, and 8LPM flow rate. All conditions were repeated in triplicate. Nicotine yield was determined by GC/MS. A multiple linear regression analysis was used to analyze the results. We found that nicotine yield was not significantly associated with nicotine form (p=.67), whereas increase in yield was significantly associated with increases in power and PG/VG ratio (p<.01). We also found that nicotine yield can be predicted

accurately from the product of the amount of liquid vaporized and the liquid nicotine concentration (R²=0.92). The results indicate that the amount of nicotine emitted by an ECIG is independent of whether the nicotine is freebase or protonated, however the PG/VG ratio and electrical power have a strong effect on yield. Regulations intended to limit nicotine emissions must consider not only nicotine concentration, but also the PG/VG ratio and device power.

FUNDING: Federal

POD34-3

**ANALYSIS OF TOBACCO SPECIFIC CONSTITUENTS IN NOVEL
TOBACCO FREE NICOTINE POUCHES**

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BACKGROUND: Tobacco-free oral nicotine pouches are novel products with increasing popularity. There are several brands of nicotine pouches on the market, and each brand offers a variety of flavors and nicotine levels. The pouches contain fine granular material and are marketed as smoke-free, spit-free, odor-free products that do not contain tobacco. We aimed to assess the content of tobacco-derived constituents in a sample of these products. **METHODS:** A convenience sample of three brands of nicotine pouches was purchased in Twin Cities metropolitan area in Minnesota: On! (2mg and 8mg nicotine) Dryft (2mg and 7mg nicotine) and Zyn (3mg and 6 mg nicotine). The products were analyzed for total and unprotonated nicotine, minor alkaloids nornicotine, anatabine, and anabasine, and the tobacco-specific N-nitrosamines (TSNA) NNN, NAT, NAB, NNK, and NNAL by using our routine validated methods. Each nicotine pouch variety was analyzed in duplicate. **RESULTS:** The amount of total nicotine ranged from 1.51 to 11.69 mg/pouch. Product pH ranged from 8.4 to 9.1, and unprotonated nicotine accounted for 70.6 % - 91.3 % of total nicotine content. Nornicotine levels ranged from 0.12 to 3.09 µg/pouch and increased with increasing levels of nicotine. Anatabine levels ranged from below the limit of quantitation to 2.6 µg/pouch, and its levels also correlated with nicotine content. The oral carcinogen NNN was present at low levels in 5 out of 7 product varieties tested, with the highest level being 6.1 ng/pouch. Among other TSNA, NAT and NAB were present in some products and NNK and NNAL were not detectable. **CONCLUSION:** Significant proportion of nicotine in novel tobacco-free nicotine pouches is present in the biologically available unprotonated form, suggesting that these products may be very effective in delivering nicotine to users. In addition to nicotine, these products contain other tobacco-derived constituents at generally low but variable levels. Exposure to such constituents may vary across users of pouches that belong to the same brand but differ in nicotine content. Research is needed to better understand the impact of these novel nicotine products on public health.

FUNDING: Federal; Academic Institution

POD34-4

**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 wide aerosol size range generated by sub-ohm devices also influenced by the presence of flavors will result in aerosol deposition across the different regions of 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

POD34-5

EFFECTS OF FLAVORANTS AND HUMECTANTS ON WATERPIPE TOBACCO PUFFING BEHAVIOR, BIOMARKERS OF EXPOSURE, AND SUBJECTIVE EFFECTS AMONG ADULTS WITH HIGH VS. LOW NICOTINE DEPENDENCE

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Significance. Flavorants and humectants in waterpipe tobacco (WT) increase product appeal. Removal of these constituents, however, is associated with increased intensity of WT puffing, likely due to reduced nicotine delivery efficiency. To provide clarity on the potential public health effects of restrictions on flavorants or humectants in WT, we evaluated the effects of these constituents on puffing behaviors, biomarkers of exposure, and subjective effects among adults with high vs. low WT dependence. **Methods.** N=39 high dependence and N=49 low dependence WT smokers completed 4 smoking sessions in a cross-over experiment. Conditions were preferred flavor with humectant (+F+H), preferred flavor without humectant (+F-H), unflavored with humectant (-F+H), and unflavored without humectant (-F-H). Measures of puff topography, plasma nicotine and expired carbon monoxide (eCO) boost, and subjective effects were assessed. **Results.** Level of WT dependence modified the effect of WT condition on average flow rate, average puff volume, and eCO boost. Although, overall, participants puffed the +F+H WT least intensely and -F-H WT most intensely, this association was strongest among WT smokers with high dependence. Participants preferred smoking the +F+H WT and achieved the largest plasma nicotine boost in that condition. **Conclusion.** Findings underscore the complexity of setting product standards related to flavorants and humectants in WT. Future research evaluating whether WT smokers with high dependence would quit or reduce their WT smoking in response to removal of flavorants or humectants from WT is necessary to appreciate the full public health effects of such policies.

FUNDING: Federal

POD34-6

ASYMMETRICAL ELASTICITY OF DEMAND FOR SELF-ADMINISTERED NICOTINE AND ALCOHOL IN RATS

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Introduction: Nicotine (NIC) and alcohol (ALC) are commonly self-administered concurrently by human users. There is evidence that consumption of either drug concomitantly increases consumption of the alternative, suggesting that they are economic complements. Despite this there are no published preclinical studies examining mutual substitution between NIC and ALC. The goal of the proposed studies was to determine if NIC and ALC could substitute for each other. **Methods:** Alcohol preferring (P) rats were obtained from the University of Indiana and instrumented for intravenous (IV) NIC self-administration. After recovery, rats were then randomly assigned to one of two groups (e.g., NIC vs. ALC or NIC alone). Each day rats were tested in operant chambers equipped to delivery IV injections and oral solutions. Meeting the schedule of reinforcement on the ALC sipper resulted in an aliquot of alcohol (0.12 ml) delivered into the sipper tube. Meeting the schedule of reinforcement on the NIC sipper resulted in delivery of IV NIC and a neutral flavor solution (0.12 ml) to make this reinforcer more comparable to oral ALC. In Experiment 1, the price of ALC was increased by increasing the FR and reducing ALC concentration. In Experiment 2, the price of NIC

was increased by increasing the fixed ratio (FR) schedule of reinforcement. For both studies, non-linear regression was used to describe the relationship between price and operant responding. **Results:** In Experiment 1 (ALC price manipulated), demand for ALC was more elastic in rats with access to NIC and ALC (NIC vs. ALC group) compared to rats with access to ALC-alone. NIC intake also increased as ALC intake declined in the NIC vs. ALC group, indicating that NIC substituted for ALC. In Experiment 2 (NIC price manipulated), demand for NIC was less elastic for the NIC vs. ALC group, relative to rats with access to NIC-alone. **Discussion:** Although NIC and ALC are traditionally considered complements, this relationship may be asymmetrical, with ALC increasing the effort to obtain NIC and reducing price sensitivity. In contrast, NIC reduces the effort to obtain ALC and increases price sensitivity.

FUNDING: Unfunded; Academic Institution



PAPER SESSION 35: INNOVATIVE APPROACHES TO OBTAIN BIOMARKERS OF DRUG USE

POD35-1

DNA METHYLATION DIFFERENTIATES NON-COMBUSTIBLE TOBACCO USE AND VAPING FROM SMOKING

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Over the past several years, the use of non-combustible forms of nicotine containing products, such as e-cigarettes, has markedly increased. The risk of these products is widely debated. In part, this debate is fueled by the lack of a clearly defined method for objectively differentiating smoking from the use of these non-combustible nicotine sources. Additionally there is evidence of unreliable subject self-report that may bias study outcomes. In prior work, we have shown that methylation status at cg05575921 may be specific for the pyrolysis of tobacco products. Therefore, we hypothesized that a combination of this new epigenetic approach and existing metabolite methods could help classify the type of nicotine product consumption. To test this hypothesis, we determined DNA methylation and serum cotinine values in a cohort of 112 daily smokers, 35 e-cigarette users, 19 smokeless tobacco users and 269 controls, then followed up all nicotine user and 20 random cotinine negative non-smoking controls with mass spectroscopy analyses to determine urinary levels of putatively nicotine product specific substances; propylene glycol, 2-Cyanoethylmercapturic acid (CEMA) and anabasine. We found that: 1) cigarette smoking was associated with a dose dependent demethylation of cg05575921 and increased urinary levels of CEMA and anabasine, 2) vaping did not demethylate cg05575921, 3) smokeless tobacco use also did not demethylate cg05575921 but was positively associated with anabasine levels 4) CEMA and cg05575921 levels were highly correlated and 5) propylene glycol levels did not reliably distinguish use groups from one another. We conclude neither smokeless tobacco consumption nor vaping are associated with cg05575921 demethylation. We suggest that through using a combination of methylomic and metabolite profiling, clinicians and researchers should be able to accurately categorize and verify the use status of a variety of nicotine containing products.

FUNDING: Nonprofit grant funding entity

POD35-2

THE DEVELOPMENT OF LATERAL FLOW ASSAYS FOR BIOMARKERS TO DISTINGUISH VARIOUS NICOTINE DELIVERY PRODUCTS

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SIGNIFICANCE: Smoking is the single most preventable cause of death and disability in the world today. More than a billion people smoke and it is predicted that there will be a billion premature deaths from smoking in this century. This issue is compounded by new nicotine products such as e-cigarettes that have infiltrated youth culture; studies considering the long-term health effects of these new products indicate they may be just as problematic as combusted tobacco. Numerous therapies have been and are being developed to reduce tobacco use in all its forms, from mindfulness to nicotine-weaning patches and gums. A major issue with all protocols intending to reduce use is that a quantitative assessment of their success is very difficult to achieve on a per patient basis. The difficulty in determining the efficacy of these efforts derives from the dishonesty in self-reporting smoking habits, in many cases, making therapies appear to be more beneficial than they really are. Gold-standard analyses to objectively report use exist, however, they are not well-suited for mass testing. It is clear that there are not enough quick and simple tools capable of monitoring usage at this scale for individuals involved in these trials as well as established programs. **METHODS:** Our contribution to helping solve this problem is to utilize a rapid and portable lateral flow immunoassay platform to objectively detect biomarkers that differentiate nicotine-related product use. These biomarkers we are investigating include nicotine, cotinine, crotonaldehyde, acrolein, 2-naphthol, 1-naphthol, NNN, S-PMA, anabasine, NNAL, anatabine, nicotelline, nickel, and chromium. Reagents to detect some of the desired targets via immunoassay are commercially available. For other targets, there are no predicate reagents. Therefore, in the work presented here, we are providing results from custom-made antibodies to various small-molecule metabolites connected to the various nicotine use categories.

RESULTS: Urine samples were collected from individuals in various tobacco-use groups. These samples were run on lateral flow immunoassays for multiple biomarkers intended to be used to differentiate use from non-use and to distinguish one use type from another. Results show the potential for an easy-to-use, inexpensive point-of-care option for monitoring tobacco use at the point of care. **CONCLUSIONS:** Future work will target multiplexing our assays onto a test strip. The marriage of the immunoassay onto a lateral flow strip for these biomarkers appears to be suitable for a quick and accurate assessment of use (both frequency and use type). Developing a rapid, sensitive, and economical tool to detect and differentiate nicotine-related product use is imperative for developing the most robust strategies that will reduce use in order to improve the health of current and future populations.

FUNDING: Nonprofit grant funding entity

POD35-3

FRACTIONAL EXHALED NITRIC OXIDE (FeNO) OUTCOMES FROM A RANDOMIZED CLINICAL TRIAL EXAMINING REDUCED NICOTINE CONTENT CIGARETTES AMONG DAILY SMOKERS WITH PSYCHIATRIC CONDITIONS OR SOCIOECONOMIC DISADVANTAGE

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Significance: Fractional exhaled nitric oxide (FeNO) is a non-invasive biomarker of lung inflammation. Prior studies demonstrate that FeNO levels are inversely related to cigarettes smoked per day (CPD), breath carbon monoxide (CO), and urine cotinine levels. It is not established what constituents in cigarette smoke contribute to FeNO suppression, but there is evidence that nicotine may contribute. The purpose of this study was to examine the role of nicotine in suppressing FeNO by examining associations between FeNO and smoking outcomes (CPD, breath CO, and urine cotinine) before, during, and after 12 weeks of exposure to very low nicotine content cigarettes (VLNCs) among individuals enrolled in a randomized controlled trial evaluating effects of nicotine content (0.4, 2.4, 15.8 mg/g) on smoking outcomes. **Method:** This is a secondary analysis of a trial evaluating the impact of VLNCs among individuals with psychiatric conditions or socioeconomic disadvantage. FeNO levels were measured using a NIOX VERO® device at baseline and Weeks 6 and 12. Analyses of variance (ANOVA) were used to evaluate associations between FeNO and smoking outcomes at baseline and Week 12 and mixed model repeated measures ANOVA to evaluate effects of nicotine content and time on FeNO and smoking outcomes using sex, age, height, and asthma/breathing problems as covariates. **Results:** FeNO levels collected from 748 of 775 trial participants were examined. FeNO levels varied inversely with all three smoking outcomes at baseline (Ps<.0001) and Week 12 (Ps<.0001). No significant differences were noted in mean FeNO levels across time (F[1, 519]=0.11, p=0.74) or by nicotine dose (F[2, 631]=2.24, p=0.11) despite approximately 30% and 20% reductions in total CPD at the 0.4 and 2.4mg/g compared to 15.8mg/g dose. **Conclusion:** To our knowledge, this study is the first to report on the effects of VLNCs on FeNO. We saw no evidence that reductions in nicotine content of cigarettes to very low levels or 20-30% reductions in total CPD across a 12-week period altered FeNO levels. These results suggest that any direct effect of nicotine on FeNO suppression may be minimal or slow to resolve.

FUNDING: Federal

POD35-4

DEVELOPMENT AND TRANSLATION OF GENOMIC ALGORITHMS FOR NICOTINE BIOMARKERS

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Significance. Identifying, validating and translating biomarkers for smoking cessation encompasses a range of approaches and challenges. Prediction of nicotine biomarkers from genomics may support learning health care system implementation of personalized



cessation therapies. **Methods.** We extended laboratory-based analyses by modeling the urinary nicotine metabolite ratio (NMR) and total nicotine equivalents (TNE) biomarkers in current cigarette smokers from the Multiethnic Cohort (N=2,239 in five race/ethnicities). We screened genetic variants using principal components-adjusted marginal scans and applied statistical and machine learning algorithms to top-ranked SNPs to build prediction ensembles for each biomarker. Using genomic and phenotype data from N=1,864 Black and White treatment-seeking smokers from The Genetic Architecture of Smoking and Smoking Cessation (dbGaP phs000404.v1.p1), we predicted the two biomarkers using these ensembles. We assessed association of predicted NMR and TNE biomarkers with nicotine dependence measures in the treatment-seeking smokers. **Results.** Genome-wide association (GWAS) of the urinary NMR resulted in SNPs with traditional genome-wide significance at chr19q13.2 and associations on 11 additional autosomes. GWAS of TNE resulted in associations on all autosomes. The prediction ensembles were constructed using equal weighting, with correlations of 0.67 and 0.65 between observed and fitted NMR and TNE, respectively. Nicotine biomarkers were estimated in the treatment-seeking smokers; we observed significant racial/ethnic differences in both predicted biomarkers. Regression of predicted nicotine biomarkers on nicotine dependence measures, adjusted for age, sex and race/ethnicity, corrected for multiple comparisons, resulted in predicted NMR significantly associated with the Fagerström Test for Nicotine Dependence (FTND) cigarette per day (CPD) subscale, and predicted TNE significantly associated with the Nicotine Dependence Syndrome Scale (NDSS) Stereotypy subscale. **Conclusion.** Genomic data and machine learning predict nicotine biomarkers with biomarker-dependence measure associations that are consistent with *a priori* knowledge (NMR-CPD), and novel (TNE-Stereotypy), requiring replication. Translation to clinical research applications will occur in multiple randomized trials of cessation therapies.

FUNDING: Federal

POD35-5

DEFAULT MODE AND FRONTOPIRIETAL SYSTEM SEGREGATION IS ASSOCIATED WITH SMOKING LAPSE

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Significance. Models of nicotine dependence posit that deficits in cognitive control contribute to failures to maintain smoking abstinence during cessation attempts. One of the best predictors of relapse is experiencing a lapse. Yet, the nature of lapses, discrete moments embedded within cessation attempts, challenges the identification of their precipitants. A second challenge for studying smoking lapses is that the precipitants of lapses may themselves change from moment to moment. We overcome these challenges by observing participants during a laboratory smoking lapse paradigm, accompanied by functional Magnetic Resonance Imaging. **Methods.** We use data from 70, five-minute functional magnetic resonance imaging (fMRI) scans in 17 daily smokers (5 female) undergoing a smoking lapse paradigm after 12 hours of smoking abstinence. Participants completed the following sequence for each of up to 10 five-minute runs: 1) participants pushed one of two buttons to signify whether they would like to start the subsequent 5-minute run of the smoking lapse task or be removed from the scanner; 2) those who elected to remain in the scanner completed a 5-minute run of the task, during which they were asked to relax and remain as still as possible with their eyes open; 3) immediately after the run ended, participants used visual analog scales to rate their affect, arousal, urge to smoke, and the intensity of their efforts to resist smoking. Participants were given the opportunity to smoke after being removed from the scanner and were paid the money that they earned during the smoking lapse task (\$1 for every 5 minutes they remained in the scanner) in cash at the conclusion of the session. For each 5-minute block, we quantified functional connectivity among the default mode and frontoparietal systems given observations that the extent of segregation of these systems is implicated in cognitive control. **Results.** Cox regression results indicate that segregation of the default mode and frontoparietal systems protects against smoking lapses. Notably, the association between segregation and smoking lapse was significant when controlling for self-ratings of affect, arousal, urge, and resistance against smoking urge. **Conclusions.** Results suggests that large-scale functional brain systems associated with cognitive control are implicated in smoking lapse behavior and point to the importance of cognitive control as a mechanism underlying smoking relapse.

FUNDING: Federal

POD35-6

STABILITY OF INSULA-BASED RESTING-STATE FUNCTIONAL CONNECTIVITY AMONG DAILY SMOKERS AND THE IMPACT OF SMOKING-RELATED FACTORS

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Background: Resting-state functional connectivity (rsFC) of the salience network is known to be impacted by state manipulations associated with smoking (e.g. withdrawal, acute nicotine intake). However, the extent to which there are reliable changes in rsFC of these regions, as a function of chronic nicotine exposure remains unclear. **Aims:** To assess the stability of insula rsFC with the dorsal Anterior Cingulate Cortex (dACC) and Nucleus Accumbens (NAc) across two study sessions and determine the extent to which the strength of rsFC is associated with various smoking factors (e.g. dependence severity, duration of smoking). **Methods:** Secondary analyses were conducted on data collected for a previous experiment (Perry et al., 2019). In the original protocol, twenty-six daily smokers were randomly assigned to receive either a nicotine inhaler (4mg deliverable) or a nicotine-free inhaler across two sessions. During each session, rsFC was assessed using magnetic resonance imaging (MRI) at baseline and again following inhaler administration. **Results:** No evidence of test-retest reliability was detected for baseline rsFC of the insula with either the NAc or dACC. In fact, we found greater within-subject variability in rsFC across sessions, relative to between-subject variability within the same session, possibly due to confounding effects associated with novelty of the MRI environment during the initial scan. Dependence severity and duration of smoking were independently associated with changes in rsFC between the insula and NAc, but not the dACC. Specifically, higher dependence severity and longer duration of smoking were each associated with weaker rsFC between the right insula and left NAc after inhaler administration. **Conclusions:** Findings are consistent with altered patterns of insula-based rsFC among smokers, as a function of chronic nicotine exposure and dependence. However, results emphasize the importance of collecting multiple baseline measures when assessing changes in rsFC, to control for intra-individual differences across scan sessions.

FUNDING: Federal



PAPER SESSION 36: LAYING THE GROUNDWORK FOR EFFECTIVE YOUTH AND YOUNG ADULT VAPING CESSATION INTERVENTIONS

POD36-1

YOUTH AND YOUNG ADULT E-CIGARETTE QUIT ATTEMPTS AND INTENTIONS TO QUIT

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Prevalence of youth and young adult e-cigarette use has risen in the U.S. Yet, few studies have explored e-cigarette cessation behavior at the population level, particularly since the rise of high-nicotine products. This study estimates quit attempts and intentions to quit among US individuals aged 15-36, and examines factors associated with e-cigarette quit attempts and intentions. Participants were drawn from a national probability-based cohort sample collected via online survey from September to December 2019. Current e-cigarette users, defined by past 30-day use and not already quit (n=1158), were asked about quit attempts in the past 12 months and intentions to quit in the future. Weighted proportions of past-year quit attempts, serious intentions to quit (in next 30 days), and general intentions to quit intentions (at some point) were calculated. Models estimated cessation outcomes with by harm perceptions, dependence, use frequency, friend use, combustible use and demographic factors. One-third of the analytic sample made a past-year quit attempt, and over half (54.2%) intended to quit at some point. Additionally, 15.3% reported serious intentions to quit. Past-year quit attempts were associated with harm perceptions (adjusted odds ratio (aOR)=2.08, 95% confidence interval (CI): 1.49-2.92), dependence (aOR=1.92, 95% CI: 1.44-2.56) and daily use (28+ days) compared to infrequent use (1-5 days) (aOR=0.23, 95% CI: 0.12-0.43). Intentions to quit were associated with harm perceptions (serious aOR=3.34, 95% CI: 2.13-5.24; general aOR=1.77, 95% CI: 1.23-2.56), dependence (serious, aOR=2.00, 95% CI: 1.32-3.05; general aOR=1.89, 95% CI: 1.41-2.52) and daily use compared to infrequent use (serious aOR=0.25, 95% CI: 0.11-0.57; general aOR=0.35, 95% CI: 0.19-0.65). All models controlled for age, gender, race/ethnicity, perceived financial situation, combustible use, and friend use. With over half of young users wanting to quit, there is a critical need for policies and resources to support e-cigarette cessation among young people.

FUNDING: Other

POD36-2

NICOTINE DEPENDENCE SYMPTOMS AMONG ADOLESCENT CIGARETTE AND E-CIGARETTE USERS ACROSS FOUR WAVES OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance: The lack of information on the relationship among nicotine/tobacco use and nicotine dependence limits the ability to effectively target risk reduction interventions. We examined the association between cigarette, e-cigarette usage and nicotine dependence symptoms in a cohort of youth included in the national, longitudinal PATH Study. **Methods:** We used data from those aged 12-17 years at Wave 1 and who indicated past 30-day e-cigarette and/or cigarette use during any of four sequential waves between 2013 and 2018 (n=2902). The retention rate was 79.5%. We identified four mutually exclusive groups as our independent variable: (1) e-cigarette use only (only e-cigarette use during any wave); (2) non-concurrent cigarette use and e-cigarette use (e-cigarette or cigarette use at any wave, but not at the same wave); (3) cigarette use only (only cigarette use at any wave); and (4) dual use (concurrent cigarette and e-cigarette use at any wave). This four category variable was treated as time invariant using 'e-cigarette use only' as the referent group. **Outcomes:** At each wave, past-year nicotine/tobacco dependence symptoms were assessed with seven questions from the *Wisconsin Inventory of Smoking Dependence Motives*. Answers were recoded as dichotomous and analyzed by symptom (e.g., "I frequently crave tobacco", "My tobacco use is out of control") and by the number of symptoms endorsed (0-7). **Results:** Over

one third of the sample were 'dual' users (34.5%) or 'e-cigarette only' users (34.4%). Accounting for relevant confounders, all three cigarette user groups had higher odds of multiple dependence symptoms compared to 'e-cigarette only' users. 'Dual' users had the highest risk (aIRR 5.17 [95% CI 4.53, 5.89, p<0.001]) of endorsing multiple symptoms. The odds of having any symptom increased over time for the entire sample (aOR=2.14 [95% CI 1.79-3.08, p<0.001]). **Conclusions:** Secondary prevention programs must take into account craving and other dependence symptoms experienced by youth, particularly those who are using multiple nicotine/tobacco products concurrently. Supported by research grants NIH/NCI R01CA203809 and NIH/NIDA R01DA044157.

FUNDING: Federal

POD36-3

IS VAPING CESSATION LIKE SMOKING CESSATION? A QUALITATIVE STUDY EXPLORING THE RESPONSES OF YOUTH AND YOUNG ADULTS WHO VAPE

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Significance: Young people are now seeking help to quit vaping. However, little is known about vaping cessation. To bridge the gap between the current state of research and the urgent need for interventions, practitioners have drawn upon smoking cessation models under the assumption that vaping and smoking are fairly similar. In this study, we sought to understand the nature and extent to which vaping is similar to smoking in order to inform the development of vaping cessation interventions for young people. **Methods:** Seven focus groups (total n=41) were conducted between November 2019 and February 2020. Eligible participants were 16-18 years of age, lived in Canada, reported past or current regular vaping, and expressed interest in vaping cessation. Focus groups were audio recorded, transcribed verbatim, and analyzed using thematic analysis methods. **Results:** Perceived similarities between vaping and smoking emerged from participant narratives: three themes relating to barriers to quitting (social benefits, stress reduction, sensory and behavioural gratification), and three relating to reasons for quitting (financial loss, industry influence, dependence). However, there were also perceived differences that emerged: three themes relating to barriers to quitting vaping (enjoyment of flavours, convenience and discreetness, lack of self-awareness of vaping behaviours), and two relating to reasons for quitting vaping (lack of trusted information, perceived social acceptability). **Conclusion:** Although there is significant overlap between vaping and smoking, understanding perceived differences in barriers to quitting and reasons for quitting is critical to advancing vaping cessation research and practice among young people.

FUNDING: Federal

POD36-4

CHARACTERISTICS OF YOUNG ADULTS ENROLLED IN A VAPING CESSATION RANDOMIZED TRIAL

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Significance: E-cigarettes are the most used tobacco product by youth and young adults in the US. Interest in quitting vaping is high among young people, but little is known about the segment of e-cigarette users who are interested in quitting. This presentation characterizes demographics, vaping behavior and dependence, and psychosocial factors among young adult e-cigarette users enrolled in the first randomized trial of a quit vaping intervention. **Method:** Recruitment and enrollment were conducted online via Facebook and Twitter ads. Eligibility criteria were US residence, age 18-24 years, ownership of mobile phone with text message plan, past 30-day e-cigarette use, and interest in quitting vaping in the next 30 days. Following a baseline assessment, participants were randomized to a text message vaping cessation intervention or assessment-only control. To examine generalizability of the enrolled sample, we compared eligible and ineligible participants using standardized mean differences. Descriptive statistics characterize the enrolled sample. **Results:** From Dec 2019-Mar 2020, 41,804 individuals visited the study website; 11,080 completed eligibility screening. There were no differences between eligible and ineligible individuals that reached the threshold of a small effect size (SMD=0.2). Of n=4,496 eligible participants, 58% (n=2,588) enrolled. The sample was 49.7% male, 15.9% racial minority, 10.5% Hispanic, 27.8% had a high school education or less, and 19.6% sexual minority. Roughly a third (35.9%) reported barely/



not meeting basic expenses. Most (93.6%) vaped nicotine daily, 82.8% vaped within 30 minutes of waking, 38.7% vaped THC in the past month, and 32.9% reported past 30-day cigarette use. Most (73%-94%) of the participants endorsed items from the Hooked on Nicotine Checklist (adapted for vaping). More than half (51.4%) scored 3 or above on either PHQ-2 or GAD-2, indicating a potential for depression or generalized anxiety disorder. **Conclusion:** Recruitment volume indicated a high level of interest in quitting vaping among young adults. Enrolled participants were daily vapers who showed strong signals of nicotine dependence. One fifth identified as a sexual minority, and more than a third co-used THC. More than half indicated potential for depression or generalized anxiety disorder. This large and diverse sample will permit important subgroup analyses to examine treatment effectiveness among individuals who may be at higher risk for e-cigarette use.

FUNDING: Nonprofit grant funding entity

PAPER SESSION 37: ADDRESSING TOBACCO CESSATION INTEGRATION IN MEDICAL SETTINGS

POD37-1

DEVELOPMENT OF A PHARMACIST-LED OPT-OUT SMOKING CESSATION TREATMENT PROTOCOL IN INPATIENT SETTINGS

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Background: Smokers are overrepresented in inpatient settings, but are infrequently connected with smoking cessation treatment during hospitalization. Inpatient pharmacists, due to their training, accountability for medication use, and monitoring of all patients, are well positioned to deliver cessation interventions to hospitalized patients who smoke. **Methods:** A large Midwestern University hospital implemented a pharmacist-led smoking cessation intervention. Hospital pharmacists were delegated authority to prescribe nicotine replacement therapy (NRT) and provide Wisconsin Tobacco Quit Line (WTQL) referral to cigarette smoking inpatients. Eligible patients received the smoking cessation intervention unless they actively refused (i.e., "opted-out"). The program was pilot tested in phases, with user feedback between phases, and then implemented hospital-wide. Electronic health record (EHR) tools were developed to efficiently prompt pharmacists to deliver and document the intervention, with minimal navigation in the EHR. Interviews, surveys, and informal mechanisms were used to identify ways to improve implementation and workflows. **Results:** Feedback from pharmacists led to changes that improved workflow, training, and patient education materials, and enhanced adoption and reach. Refining implementation strategies across pilot phases increased the percentage of eligible smokers offered cessation support from 37% to 76%, the percentage prescribed NRT from 2% to 44%, and the percentage referred to the Wisconsin Tobacco QuitLine (WTQL) from 3% to 32%. **Conclusion:** Hospitalizations provide an opportunity for patients to make a quit attempt and pharmacists may help capitalize on this opportunity by integrating smoking cessation treatment into existing medication reconciliation workflows. Implementation strategies refined with user input and feedback in this study may be applicable in other inpatient settings.

FUNDING: Federal

POD37-2

MOVING FROM IN-PERSON TO VIRTUAL INPATIENT TOBACCO TREATMENT: EXPANDING REACH IN THE FACE OF COVID-19

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Significance: Evidenced-based tobacco treatment for hospitalized patients includes counseling during hospitalization, access to pharmacotherapy, and follow-up within a month of discharge.¹⁻² In March 2020, the COVID-19 pandemic resulted in transformation of a large tobacco treatment inpatient program (TTP) from an in-person to a virtual counseling and treatment program. Because smoking is associated with increased severity of and death in hospitalized patients with COVID-19, the transition to a virtual program was vital to ensure staff safety and reduce risk exposure. To maintain continuity and minimize potential spread of COVID-19, TTP became flexible in their approach by swiftly pivoting to virtual treatment in compliance with Clinical practice guidelines.³ **Methods:** Eligibility: Adults admitted to a large academic medical center between November 2019 and July 2020 with a positive tobacco status (self-report of current combustible, smokeless tobacco, or electronic nicotine delivery system use). Utilizing an opt-out approach, TTP contacts eligible patients to offer of tobacco use treatment during admission. Patient data was extracted from the Electronic Health Record between November 2019 and July 2020. **Results:** TTP maintained continuity of care by providing evidence-based tobacco treatment to admitted patients in-person exclusively prior to March 2020 and over the phone exclusively after March 2020. In both instances, TTP staff documented encounters in electronic medical record, describing recommendations for nicotine replacement therapy and informed patient's clinical staff of specific interventions enacted during in-person or virtual counseling session. In the 4 months prior to March (November 2019 to February 2020), TTP reached a mean of 225 (227 median) patients



per month through face-to-face tobacco treatment offering. In the first 4 months of the virtual program (April 2020 to July 2020), TTP increased its reach offering the same tobacco treatment via telephone to a mean of 355 (362 median) patients per month, representing a 58% increase in the average number of patients reached with an offer for tobacco treatment counseling. TTP continued to be reimbursed for these visits with tobacco counseling codes 99406-7 throughout both face-to-face only and telephone-only counseling offerings. **Conclusions:** The transition to virtual treatment allowed TTP to ensure the safety of staff and patients while maintaining continuity of care. TTP staff adapted workflows and expanded reach with improvements in workflow efficiency when providing telephone versus in-person counseling. Visit coding and reimbursement per session remained stable due to CMS expanding allowable codes for telehealth during the pandemic. Future research is necessary to explore the efficacy of virtual treatment and evaluating long-term quit rates with the transition of in person to virtual treatment.

POD37-3

FACTORS ASSOCIATED WITH DISPARITIES IN PROVIDER ADVICE AND ASSISTANCE AMONG LATINO AND NON-LATINO WHITE SMOKERS IN CALIFORNIA

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Significance: Previous studies have reported that Latino smokers are less likely than Non-Latino (NL) white smokers to receive provider advice to quit and assistance for cessation treatments. Latinos historically have reduced access to healthcare, but the Affordable Care Act (ACA) increased access for many Latinos. We examine factors (acculturation, tobacco behavior, health care access) associated with disparities in California Latino and NL white Medicaid smokers receiving provider advice and assistance in the post-ACA. **Methods:** The study includes Latino and NL White current adult smokers ages 18-64 who were covered by Medicaid and saw a provider in the past 12 months (n=1,861) from the California Health Interview Survey (2014, 2016-2018). The two self-reported primary outcomes were provider advice to quit smoking and receiving cessation information or referral. Factors examined included sociodemographics, acculturation measures, smoking intensity, and health-related variables. Bivariate and multivariate logistic regression was conducted with SAS. **Results:** Latino smokers were less likely than NL Whites to report provider advice (38.3% Latinos vs. 55.3% NL White, p=0.01) and receiving assistance with cessation information/referrals (21.8% Latinos vs. 35.7% NL White, p=0.03). In the unadjusted model, race was significantly associated with each outcome. Compared to NL Whites, Latino smokers were less likely to receive provider advice to quit smoking (OR=0.5, 95% CI: 0.3-0.9) and also less likely to report receiving a referral or cessation information (OR=0.4, 95% CI: 0.2-0.9). However, in the adjusted model, race was no longer significant. Multivariate logistic regression showed that smokers with more office visits (adjusted OR=2.3, 95% CI 1.5-3.6) and those reporting a chronic disease (adjusted OR=2.0, 95% CI 1.2-3.4) were more likely to receive advice or assistance from a provider. Similarly, daily smokers compared with non-daily smokers (adjusted OR=2.3, 95% CI 1.0-5.0) were more likely to receive assistance. **Conclusion:** Despite having Medicaid, Latino smokers continue to report less provider advice and assistance to quit than Non-Latino White counterparts. These disparities with less provider advice may be explained in part to Latino smokers having fewer office visits or not having a chronic disease, and less provider assistance due to Latinos smoking less. Future efforts to eliminate these ongoing disparities for Latino Medi-Cal smokers might consider strategies outside of the clinical encounter, such as community-based engagement and population health outreach.

FUNDING: State

POD37-4

A QUALITATIVE ANALYSIS OF NICOTINE REPLACEMENT THERAPY UPTAKE, ADHERENCE AND PERSISTENCE AMONG PRIMARY CARE PATIENTS WHO SMOKE

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SIGNIFICANCE: Suboptimal nicotine replacement therapy (NRT) uptake, adherence, and persistence limit NRT's effectiveness as a smoking cessation aid. Up to 50% of smokers never fill their NRT prescription and <40% use the recommended number of doses. Our primary objective was to explore the facilitators and barriers to NRT adherence patterns among smokers in primary care. **METHODS:** 36 interviews from 2 pilot phases of a proactive text messaging study for smoking cessation among primary care patients were conducted between 2017-2019. Phase 1 patients (n=15) were asked

about prior NRT use. Phase 2 patients (n=21) were given NRT. All were asked about 3 parts of the NRT adherence pathway: uptake, adherence (using the recommended dosing regimen), and persistence of use (time before discontinuing). 2 coders iteratively analyzed emergent themes using the constant comparative method. Analysis was organized using NVivo 12. **RESULTS:** Participants (n=36) were 44% female; 83% white; age M=51 (SD=8.8); 31% on Medicaid. Barriers and facilitators varied for NRT uptake, adherence, and persistence. Concerns about safety, negative stories from peers, and a lack of information on NRT were pervasive barriers. Many participants worried they would have a heart attack if they smoked while wearing the patch and desired more guidance. Barriers specific to uptake included cost and beliefs that using NRT for smoking cessation was "just changing the addiction." 2 uptake processes emerged: some participants initiated NRT when ready to quit, while others contrastingly felt that having NRT raised hope and self-efficacy, which prompted them to take action to quit. Regarding adherence, incorporating NRT into one's routine was seen as a facilitator. Side effects and bad taste were barriers to persistence, as were lack of immediate effectiveness and the perception that NRT did not alleviate the "oral fixation" attached with smoking. **CONCLUSION:** Facilitators and barriers to NRT uptake, adherence, and persistence vary among primary care patients who smoke. Safety concerns and information needs impact all three behaviors. These are key issues for providers to address to help smokers to gain the full benefit of NRT.

FUNDING: Federal; Academic Institution

POD37-5

BARRIERS TO IMPLEMENTING THE CLINICAL PRACTICE GUIDELINES FOR TREATING TOBACCO USE AND DEPENDENCE AMONG PARENTS OF PEDIATRIC EMERGENCY DEPARTMENT PATIENTS

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Significance: Pediatric Emergency Department (PED) and Urgent Care (UC) healthcare professionals do not regularly screen for or systematically use evidence-based guidelines to address parental tobacco use and child tobacco smoke exposure (TSE). PED/UC professionals can play a key role in the delivery of the clinical practice guidelines for treating tobacco use and dependence. Understanding PED/UC professionals' perceptions of implementing these guidelines is the first step in the process of PED/UC intervention development. The study aim was to: identify current behaviors of PED/UC professionals related to parental tobacco use and child TSE that an intervention will target, determine barriers and enablers that influence this behavior, and clarify roles and responsibilities in delivering the guidelines. **Methods:** Semi-structured, focused interviews were conducted with 29 actively practicing PED/UC clinical staff who worked at one large, Midwestern children's hospital. The interview guide was informed by the Theoretical Domains Framework (TDF) which is commonly used to identify elements essential for healthcare-based implementation outcomes. Content analysis of interview transcripts was performed using a thematic framework analysis approach. **Results:** Overall, 80% of participants were female and their mean (standard deviation) age was 41.6 (10.2) years. A total of 51% were nurses, 38% were physicians, and 11% were healthcare administrators. All 14 TDF domains arose in relation to screening and counseling for parental tobacco use and child TSE. Important domains were: 1) *knowledge* such as lack of awareness about readily available counseling resources; 2) *beliefs about capabilities* such as perceiving it is easier to talk to parents who seem receptive and not defensive about the topic; 3) *beliefs about consequences* such as not addressing child TSE may result in repeat PED/UC visits; 4) *memory, attention, and decision processes* such as child TSE may not be brought up unless the PED/UC room smells like smoke; 5) *environmental context and resources* such as needing reminders and extra time to provide counseling; and 6) *emotion* such as feeling stressed to complete acute care-related tasks in a timely manner. Most professionals did not currently follow the guidelines, but perceived addressing parental tobacco use and child TSE could be part of their role. **Conclusion:** These findings confirm the need for the development of an intervention addressing the TDF domains to support PED/UC professionals' delivery of the clinical practice guidelines.

FUNDING: Federal

**POD37-6****ANALYSIS OF CLINICIAN DOCUMENTATION OF PATIENT E-CIGARETTE UTILIZATION USING NATURAL LANGUAGE PROCESSING**

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Given the health effects of electronic cigarettes (e-cigarettes), it is important for clinicians to accurately ascertain and record e-cigarette use in their patients. However, current documentation of e-cigarette use in electronic health records (EHR) is inconsistent, as most EHRs have limited capabilities to document such use. The objective of this study was to develop a method to ascertain the documentation in clinical notes of current e-cigarette use. The algorithm was then applied across Mayo Clinic, which cares for nearly 1.5 million people annually and uses a single, integrated electronic health record (EHR) system (Epic®). Using Clinical Language Analysis Services Infrastructure and the Advanced Text Explorer application, we used a training cohort of patients to develop a NLP algorithm that determined current e-cigarette use from clinical notes in the EHR. Design challenges included the multitude of terms used to describe these devices, and distinguishing between current and past use. In a validation cohort of 600 patients, with the "gold standard" of actual current use defined by manual EHR review, the algorithm sensitivity was 99.65%, specificity was 99.33%, positive predictive value was 95.66% and negative predictive value was 99.66%. After validation, the algorithm was applied to the clinician notes of all outpatient visits at Mayo Clinic from October 5, 2018 to September 5, 2019. The algorithm found that 0.84% seen at Mayo Clinic over this period was mentioned as being current e-cigarette users by their provider. Comparisons between Mayo Clinic patients and national surveys have limitations, but this appears to be less than reported national prevalence rates. We conclude that the NLP algorithm is a highly sensitive and specific means to ascertain current e-cigarette use in the EHR, and has the potential to contribute both to clinical care and to research regarding the use of e-cigarettes by patients.

FUNDING: Academic Institution

PAPER SESSION 38: BREATHING IT IN: EFFECTS OF EXPOSURE ON THE RESPIRATORY TRACT**POD38-1****CHEMICAL ADDUCTS OF REACTIVE FLAVOR ALDEHYDES FORMED IN E-CIGARETTE LIQUIDS ARE CYTOTOXIC AND INHIBIT MITOCHONDRIAL FUNCTION IN RESPIRATORY EPITHELIAL CELLS**

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Introduction Flavor aldehydes in e-cigarettes, including vanillin, ethyl vanillin (vanilla) and benzaldehyde (berry/fruit), rapidly undergo chemical reactions with the e-liquid solvents propylene glycol and glycerol (PG/VG) to form chemical adducts named flavor aldehyde PG/VG acetals, that efficiently transfer to e-cigarette aerosol and leading to user exposure. The objective of this study was to determine whether these acetals cause cytotoxicity and metabolic toxicity in respiratory epithelial cells and to compare their effects to the parent aldehydes. **Methods** Using BEAS-2B cells, a human bronchial epithelial cell line, and HNEpC's, a primary human nasal epithelial cells, LIVE/DEAD and Click-iT EDU cell proliferation assays were conducted to compare the potential cytotoxic and cytostatic effects of benzaldehyde and vanillin and their corresponding PG acetals. Additionally, live-cell metabolic assays were carried out in BEAS-2B and A549 cell line (an alveolar epithelial cell line) to assess the effects of benzaldehyde, vanillin, ethyl vanillin and their corresponding PG acetals on key bioenergetic parameters of mitochondrial function by monitoring flavorant induced changes in oxygen consumption rate of BEAS-2B cells. **Results** In a concentration-dependent manner, benzaldehyde PG acetal exposure (1-10mM) induced increased cell mortality in BEAS-2B and HNEpC cells, compared to benzaldehyde. Vanillin PG acetal was more cytotoxic than vanillin only at the highest concentration tested but both diminished cellular proliferation in a similar concentration-dependent manner. Compared to their parent aldehydes, PG acetals diminished several key parameters of cellular energy metabolic functions, including basal respiration, ATP production and spare respiratory capacity. **Conclusions** Reaction products formed in e-liquids between flavor aldehydes and solvent chemicals have differential toxicological properties from their parent flavor aldehydes and may contribute to the health effects of e-cigarette aerosol in the respiratory system of e-cigarette users. Funding: U54DA036151 (NIDA/FDA) and R01ES029435 (NIEHS)

FUNDING: Federal

POD38-2**CYTOTOXIC EFFECTS OF E-CIGARETTE AEROSOLS CONTAINING NICOTINE SALTS ON PRIMARY HUMAN SMALL AIRWAY EPITHELIAL CELLS**

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Significance: While consumption of combustible tobacco cigarettes continues to be the most popular nicotine-containing products in the United States, alternative products called E-cigarettes (EC) are rapidly evolving. Among ECs, a new generation of nicotine vaporizers called pods are becoming increasingly popular among youth, most notably, one brand, Juul. Each pod holds a highly concentrated solution of nicotine salt. We studied the impact of exposure to emissions from e-cigarettes containing either freebase nicotine or nicotine salts including nicotine benzoate, nicotine salicylate and nicotine levulinate on toxicity to primary human small airway epithelial cells (SAEC). **Methods:** Inhalation toxicity of three unflavored nicotine salt-containing e-cigarettes was examined *in vitro* using an air-liquid interface (ALI) with primary human small airway epithelial cells. Half a million cells were cultured overnight on 24-well format transwells and exposed directly to 330 puffs from nicotine salt-containing e-cigarettes over a period of 3 hr. At the end of the exposures, cytotoxicity was measured after a 24 hr-recovery period using neutral red uptake, trypan blue dye-exclusion and lactate dehydrogenase activity assays. Cytotoxic effects of each tested product were compared with an air control. All the e-liquids were prepared in PG:VG (50:50). **Results:** Results from our studies clearly indicate that both nicotine as freebase nicotine or as nicotine salt induced significant toxicity in SAEC cells compared to both air controls as well as solvent PG:VG-aerosol exposure controls. However, we found that nicotine salts induced markedly more toxicity in SAEC cells compared to freebase nicotine. Furthermore, nicotine benzoate-aerosols



induce higher toxicity in SAEC cells than nicotine salicylate or nicotine levulinate. **Conclusions:** Our studies reveal that emissions from nicotine salt-containing products have greater cytotoxic effects on human small airway epithelial cells than freebase nicotine.

FUNDING: Federal; Academic Institution

POD38-3

EFFECT OF ELECTRONIC CIGARETTE LIQUID PH ON RETENTION OF ¹¹C-NICOTINE IN A RESPIRATORY TRACT MODEL

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SIGNIFICANCE: Based on our previous preliminary [¹¹C]nicotine PET imaging studies in humans (Solingapuram Sai et al., 2020), we speculated that decreased brain nicotine accumulation from electronic cigarettes (E-cig) vs combustible cigarettes can be explained by observed increased deposition of nicotine in the respiratory tract, which could result from the alkaline pH of typical e-liquids. To address this hypothesis we assessed the effect of e-liquid pH on the retention of nicotine in vitro using [¹¹C]-nicotine, PET in a respiratory tract model. **METHODS:** A single 2 sec 35 mL puff was delivered to a respiratory tract model (Sul et al., 2018) from a 2.8 Ohm E-cig V2 EX Blanks refillable cartomizer (Mig Vapor LLC), at 4.1 volts, coupled with a programmable air syringe pump. Immediately after the puff, a 2-sec 700 mL air wash-in volume was administered. E-liquids (vegetable glycerin and propylene glycol 50/50 vol/vol) containing 24 mg/mL nicotine were mixed with [¹¹C]nicotine. Deposition (retention) of nicotine was assessed using a GE Discovery MI DR PET/CT scanner. Seven e-liquids with different pH (range 5.2 - 9.6) were investigated (n=5-8 per condition). Lactic acid was used for the adjustment of e-liquid pH. All experiments were performed at room temperature and relative humidity 70%-80%. **RESULTS:** Retention of nicotine in the respiratory tract model pH-dependent and the pH-sensitive component of the retention can be well described by a sigmoid curve. The 50% of the maximal pH-dependent effect was observed at pH 8.0, which was close to the pKa of nicotine. The maximal retention of nicotine was 9.4% of the total administered dose (TAD) and ¾ of this retention (7.1% TAD) was pH-dependent. More than 50% of the maximal retention of nicotine in the respiratory tract (5.2% TAD) was observed in the mouth cavity. Analysis of the proton concentration effect on the pH-sensitive component of nicotine retention revealed that the Hill coefficient was close to one ($n_H=0.93$). **CONCLUSION:** The retention of nicotine in the respiratory tract is dependent on the e-liquid pH. Lowering e-liquid pH reduces retention of nicotine in respiratory tract. Nonetheless, the reduction of pH below 7 has little effect.

FUNDING: Federal

POD38-4

MOUSE MODEL OF ACUTE EFFECTS OF INHALATION OF HEATED TOBACCO PRODUCT (IQOS) AEROSOLS ON LUNG TISSUE DAMAGE AND INFLAMMATORY CHANGES IN THE LUNGS

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Cigarette smoking is recognized to be a significant risk factor for the development of COPD, several cancers, cardiovascular and oral diseases. Cigarette smoke (CS) triggers inflammation and other physiological changes in the airway epithelium causing pulmonary damage and suppression of both innate and adaptive immunity resulting in repeated infections. Philip Morris International (PMI) developed a heated tobacco product (HTP), also called 'Heat-not-Burn' (HnB) product, that is currently marketed under the brand name IQOS. On July 7th 2020, the FDA approved the MRTP application for IQOS based on scientific studies that switching completely from conventional cigarettes to the IQOS system significantly reduces the body's exposure to harmful or potentially harmful chemicals. In our study, numerous markers of lung damage and inflammation including albumin and lung immune-cell infiltrates, proinflammatory cytokines and chemokines were quantified in lungs and bronchoalveolar (BAL) fluid from IQOS, CS or air-exposed (negative control) mice. Our study demonstrates that even short-term inhalation of aerosols from IQOS generates damage and proinflammatory changes in the lung that are substantially similar to that elicited by CS-exposure.

FUNDING: Federal

POD38-5

EFFECT OF CIGARETTE SMOKING ON M1/M2 TYPES ALVEOLAR MACROPHAGE (AM) AND THE RESTORATION OF AM BY SMOKING CESSATION

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Introduction: Cigarette smoking is the most important risk factor for pulmonary disease. Alveolar macrophages (AM) play an important role of immune system in the lung. AM are classified in M1 and M2 types. We previously reported that immune functions of AM are suppressed by cigarette smoking. However, the restoration of AM after cigarette smoking cessation is not fully understood. Therefore, we investigated the effect of cigarette smoking and the restoration of M1/M2 type AM by smoking cessation. **Materials & Methods:** 8-weeks-old female C57BL/6N mice were used. KENTUCKY RESEARCH CIGARETTE were used. Mice were exposed to the smoke of twenty cigarettes per day for 10 days by using MIPS smoking machine. After exposure to cigarette smoke, AM were recovered by Broncho Alveolar Lavage (BAL) at 1day, 1, 2, 3, 4, 5, 6, 7 and 8 weeks after smoking. Morphology and ultrastructure of AM were observed by light and scanning transmission electron microscope. Dot plots and expressions of cell surface antigens (CD11c as M1 marker, CD206 as M2 marker) were analyzed by FACS Calibur. TNF- α mRNA expression was evaluated by RT-PCR. Cytotoxicity was measured by lactate dehydrogenase (LDH) assay. **Results:** Number of AM was increased by smoking, and was restored the level of non-smoked mice at 8 weeks after smoking cessation. Morphology and Dot plots of AM were changed by smoking. However, Dot plots were restored to the level of AM in non-smoked mice at 8 weeks after smoking cessation. CD206 expression was significantly decreased by smoking, but it was restored by smoking cessation at 8 weeks up to the non-smoke level. CD11c expression was almost unchanged by smoking. TNF- α mRNA expression was significantly decreased by smoking, but it also was restored after smoking cessation. Cytotoxicity of AM was reduced by smoking and was restored by smoking cessation. **Conclusion:** Morphology of AM was changed and M2 AM was strongly affected by smoking. However, these effects of AM were restored by smoking cessation. These results suggest that smoking cessation may contribute to inhibition of development in pulmonary disease.

**PODIUM PRESENTATION 10****FEATURED POSTER SESSION 51:
FEATURED HEALTH DISPARITIES &
HEALTH EQUITY POSTERS****POD51-1****RURAL DISPARITIES IN LIFETIME SMOKING PREVALENCE ARE WIDENING OVER TIME**

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Significance Rural residence is a well-established risk factor for adverse health behaviors and subsequent morbidity and mortality in the United States. Smoking is the primary cause of preventable death and more prevalent in rural America. As chronic smoking habits typically develop during adolescence, the discrepancy in smoking rates between rural and urban youth likely contribute to a significant geographic disparity in long-term health of adults. **Methods** Data were extracted from 12th-grader surveys of the Monitoring the Future study from 1998 to 2018. The historic trends of lifetime smoking and lifetime regular smoking rates of rural and urban adolescents were estimated with intercept-only time-varying effect models. Trends of the disparity in lifetime smoking prevalence among rural youth were calculated from these models. **Results** The disparity in lifetime smoking prevalence among rural youth has markedly increased since 1998. This steep increase in disparity resulted in a 13.5% higher prevalence of lifetime smoking among rural adolescents compared to their urban counterparts in 2018, compared to 6.9% in 1998. This discrepancy is among the highest that has been observed in the past 20 years and demonstrates an alarming upward trend. In contrast, the difference in ever-regular smoking prevalence has shown some fluctuations but an overall net decline, where the disparity between rural and urban youth decreased from 6.4% in 1998 to 4.8% in 2018. **Conclusion** Though overall smoking prevalence continues to decline, this trend is significantly attenuated among rural adolescents compared to urban youth. The increasing disparity in lifetime smoking prevalence may be attributable to disadvantaged sociodemographic factors, relaxed smoking norms within the community, weak regulatory enforcement and limited reach of anti-tobacco campaigns may be attributable to this emerging trend. This geographic disparity between rural and urban adolescents represents a potentially modifiable cause of increased morbidity and mortality in the rural area. Public health interventions and regulatory efforts should be tailored for rural adolescents to reduce this worsening health disparity.

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

POD51-2**“THEY PROMOTE THEM EVERYWHERE IN THE NEIGHBORHOOD:” A QUALITATIVE INVESTIGATION OF THE COMMUNITY-LEVEL RISK FACTORS OF CIGAR SMOKING AMONG BLACK YOUNG ADULTS**

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INTRODUCTION Black young adults have one of the highest cigar smoking prevalence among all population groups. Reducing their cigar smoking requires actionable public policies at community levels. This study aims to elucidate the community-level risk factors of cigar smoking to inform such actions. **METHODS** Between May and June 2020, we conducted 40 in-depth phone interviews to explore the community-level risk factors for smoking cigars (large cigars, cigarillos, filtered cigars) and blunts among Black young adult cigar smokers ages 21-29. Interviews were audio-recorded, transcribed and coded by three coders. We used a thematic analysis to assess emerging themes and subthemes related to cigar use. **RESULTS** Several major themes of community-level risk factors emerged from the interviews. The widespread sales of cigar products at community retailers (e.g., gas stations and corner stores) facilitate easy purchasing of cigar products, especially cigarillos. Cigar marketing materials are ubiquitous in community retailers and facilities and often promote cigar brands, new flavors, and discounted prices and coupons. Smoking cigars and blunts is a community norm and considered as part of the neighborhood culture. Specific cigar flavors (e.g., fruits and wine) and

brands (e.g., Backwoods and Black & Mild) are highly preferred and commonly used by community members. Seeing cigar litter (e.g., tips and wraps) and other people smoking tobacco and smelling burning cigars and marijuana trigger cigar smoking. Experiencing collective stress from the community as a whole also prompts cigar smoking episodes. **DISCUSSION** Community-level risk factors, especially targeted cigar marketing strategies (e.g., widespread sales, ubiquitous marketing, and low pricing), put Black young adults at great risks of cigar and blunt smoking. Such strategies could shape other risk factors over time, including community acceptability of smoking flavored cigars and blunts. Local policy efforts such as price promotion bans, minimum prices, and flavored product sales restrictions may help counteract the cigar marketing strategies targeting Black communities to reduce cigar-related health disparities.

FUNDING: Unfunded

POD51-3**OBJECTIVE AND PERCEIVED MEASURES OF TOBACCO MARKETING ARE UNIQUELY ASSOCIATED WITH CIGAR USE**

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Little is known about how tobacco marketing is associated with youth non-cigarette tobacco use. We investigated whether daily exposure to outdoor marketing within activity spaces and perceived exposure to tobacco marketing were associated with cigar use. We used Geographic Ecological Momentary Assessment data from youth aged 16-20 years (n=86 participants, n=962 observations) in 8 mid-sized California cities. Participants completed an initial survey, daily surveys, and carried GPS-enabled phones for 14 days. Tobacco outlets in study cities were visited by observers to record outlet GPS point locations and data concerning tobacco marketing. GPS locations were geocoded and activity spaces were constructed by joining sequential points. Our objective measure of tobacco marketing was defined as the number of outlets with outdoor tobacco marketing within 50m of these polylines. Daily surveys asked about tobacco use and whether participants saw tobacco ads in or by their (1) neighborhood, (2) school, (3) workplace, and (4) anywhere else each day. These items created a continuous measure of daily perceived exposure to tobacco marketing. We considered cigar use including or excluding blunt use. We used multilevel mixed effects models to control for clustering of observations within participants over time. Controlling for demographics, we found that increasing exposure to tobacco outlets with outdoor marketing was associated with higher odds of cigar use each day, excluding blunt use (aOR: 1.41; 95% CI: 1.05, 1.89). Also, increasing perceived exposure to tobacco marketing was associated with higher odds of cigar use each day, excluding blunt use (aOR: 2.16; 95% CI: 1.10, 4.23). For cigar use including blunt use, we did not find a significant relationship with exposure to tobacco outlets with outdoor marketing (p=0.11), but we did find that increasing perceived exposure to tobacco marketing was associated with higher odds of use (aOR: 1.89; 95% CI: 1.28, 2.79). Results suggest that both objective and perceived measures of tobacco marketing are associated with cigar use. Perceptions of blunt as a cannabis but not tobacco product may explain the different results.

FUNDING: Federal; State

POD51-4**RACIAL & ETHNIC TOBACCO DISPARITIES IN THE U.S. MILITARY**

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U.S. military tobacco rates have historically been higher than civilian populations. Tobacco disparities in civilian adult and adolescent populations exist, with rates of current use of any tobacco product highest among non-Hispanic (NH) American Indian/Alaska Natives, Native Hawaiian/Other Pacific Islander, and multiracial individuals compared to other racial/ethnic backgrounds. Less is understood about military racial/ethnic tobacco disparities. The current study compared prevalence rates of current tobacco use across products by race/ethnicity (NH White, NH Black, NH Asian, NH Native Hawaiian/Other Pacific Islander, NH American Indian/Alaska Natives, NH multiracial, and Hispanic) in



a large sample of U.S. Air Force trainees (N= 28,763). Next we compared prevalence rates across racial/ethnic groups to weighted rates in the National Health Interview Survey (NHIS) of U.S. adults and the National Youth Tobacco Survey (NYTS). In our military sample, e-cigarettes were used most commonly (12.1%), followed by cigarettes (7.3%), cigars (6.9%), smokeless tobacco (5.9%), hookah (3.3%), and pipe tobacco (0.6%). By product, for e-cigarettes, NH Native Hawaiian/Other Pacific Islander had the highest prevalence (16.2%) compared to other groups (Range: 5.0% NH Black - 15.3% NH White). For cigars, NH American Indian/Alaska Natives had the highest prevalence (8.6%) comparatively (Range: 1.9% NH Asian - 7.9% NH White). Similarly, for hookah, highest prevalence (4.7%) was among NH American Indian/Alaska Natives comparatively (Range: 2.7%: NH White - 4.3%: Hispanic). In the military sample, overall rate of any tobacco use was high (22.1%), particularly for NH White personnel (27.3%), compared to civilian adults (19.7%). However, in this sample, NH American Indian/Alaska Natives and NH Native Hawaiian/Other Pacific Islander personnel were disproportionately using e-cigarettes, cigars, and hookah. Comparisons to prevalence rates found in the NHIS and NYTS will be discussed. Results highlight the importance of tailoring tobacco interventions and policies specifically to the product used, particularly in the U.S. military, given tobacco disparities impacting products differently.

FUNDING: Federal

POD51-5

EVOLUTION FROM JOE CAMEL: IMPACT OF TOBACCO MESSAGING AND COMMUNICATION ON TOBACCO USE ACROSS RACE, ETHNICITY, AND GENDER OVER TIME

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Racial minorities have historically been heavily targeted by tobacco companies. Little is known about how individuals from racial minority groups may be differently impacted by tobacco-related messages. In this study, U.S. Air Force trainees, who are racially diverse and also have an extensive history of targeting by tobacco companies, reported demographics, tobacco use, and exposure to positive tobacco messages from social sources (i.e., friends, family, social media) and environmental sources (i.e., advertisements and promotions). Tobacco use was reported one-year later. At baseline, exposure to positive tobacco messaging was examined by race (White, non-White, multiracial), while controlling for other demographics. Multinomial logistic regression models assessed how tobacco messaging exposure and demographic characteristics influenced tobacco use at one-year follow-up. At baseline, differences in race were found in reported sources of tobacco messaging; although White personnel were more likely to be exposed by friends, family, and environmental sources than other racial groups, multiracial individuals were 1.23 times more likely to receive tobacco messaging from social media compared to White individuals (OR=1.24, p=.051). In final longitudinal multivariate models, non-White participants who were exposed to environmental tobacco messages were more likely to use tobacco products at one-year follow-up (OR=1.5, p=.03) compared to non-White individuals who were not exposed to environmental messages, whereas there was no observed environmental exposure effect observed among White individuals (p > .05). Social sources were not associated with tobacco use at follow-up for any group (p > .05). Increased visibility of tobacco promotions and advertisements among racial minorities in our sample had greater influence on long-term tobacco use compared to White individuals. We will discuss the implications of these findings in the development of tobacco interventions and policies which address exposure to these environmental sources of tobacco messaging among U.S. military young adults, particularly those of racial minorities.

FUNDING: Federal

POD51-7

COMMUNITY VULNERABILITY AND REAL-TIME CONTEXT OF TOBACCO MARKETING EXPOSURE —AN ECOLOGICAL MOMENTARY ASSESSMENT AMONG NON-TOBACCO-USING YOUNG ADULTS

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INTRODUCTION High amounts of tobacco marketing have been found in vulnerable communities (VCs) and may lead to disproportionate use of tobacco products. Tobacco marketing exposure (TME) is a risk factor for tobacco use initiation. Ecological Momentary Assessment (EMA) is well-suited to capture the real-time context of TME within communities with varying risks of tobacco use. This study examined real-time TME among non-tobacco-using young adults. **METHODS** Data were from an EMA study that assessed context (e.g., location, activity) of TME using four text-messaging surveys per day over 14 days. Non-tobacco-using young adults (n=152; ages 18-24) living, working, or attending school in Washington D.C. recorded 5,285 surveys. Of these, twenty participants (13.2%) came from VCs with high proportions of lower income, racial/ethnic minority residents, and high smoking rates. Unadjusted and adjusted multilevel logistic regressions were used to assess the odds of exposure to any and flavored tobacco marketing in relation to community vulnerability and context. **RESULTS** Fifty-nine participants (40.4%) reported at least one TME and recorded 94 TME moments over 14 days. In adjusted analyses, odds of TME were higher among those from VCs (AOR=2.6, 95% CI=1.2-5.4), in the presence of anyone using tobacco vs. no tobacco use (AOR=4.2, 95% CI=2.5-7.1), outside/in transit (AOR=7.6, 95% CI=3.2-18.0), at store/retail (AOR=8.1, 95% CI=1.5-43.6), or online (AOR=2.8, 95% CI=1.0-8.2) vs. at home. Additionally, odds of flavored TME were higher among those from VCs (AOR=7.2, 95% CI=2.3-22.2), in the presence of anyone using tobacco vs. no tobacco use (AOR=4.3, 95% CI=2.1-8.9), or outside/in transit vs. at home (AOR=5.6, 95% CI=2.2-14.0). **DISCUSSION** Non-tobacco-using young adults may be predominantly exposed to tobacco marketing in social environments allowing tobacco use and through retail, outdoor and online/social media advertising. Individuals in VCs are at increased risk of seeing any and flavored tobacco marketing which could contribute to tobacco use disparities. Policies and programs are needed to reduce differential exposure to tobacco marketing and flavors to improve health equity.

FUNDING: Federal; Academic Institution

POD51-8

EXAMINING RISKS AND PROTECTIVE FACTORS FOR CIGARETTE SMOKING AMONG TRANSGENDER AND GENDER EXPANSIVE INDIVIDUALS USING DIGITAL PHOTOVOICE

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Background: Transgender and gender expansive (TGE) communities have a higher smoking prevalence of 35.5% compared to 14.9% in cisgender adults. This study examined risk and protective factors for cigarette smoking among TGE adult current smokers using digital photovoice methods. **Methods:** The study was guided by the minority stress model, resilience framework, and the socio-ecological model. We enrolled 47 TGE adults ages 18+ who are current cigarette smokers in the US using online advertising (Facebook, Instagram, Craigslist), community outreach, print flyers, and snowball recruitment. Participants first completed an online baseline survey. Next, they were assigned to private groups on either Facebook (5 groups) or Instagram (3 groups) and were asked to share pictures with captions of smoking risk and protective factors daily over 21 days. We then conducted a follow-up survey and focus group discussions for in-depth exploration and labelling of these factors in their own words within each group of participants. We coded these factors as those experienced by the general population or specific to TGE individuals. **Results:** General protective factors for smoking included concern for the health of pets and animals, engaging in healthy behaviors like exercise and nutrition, and being distracted by other tasks. General risk



factors were work, school, and general stress, daily routines or habits, and substance use. Environmental factors, such as weather, and influence of friends or peers were illustrated as both risk and protective factors, depending on the context. TGE-specific risk factors included minority stress and harassment, while concern for transition-related health was a protective factor. While general factors were frequently discussed, TGE-specific factors were identified as important considerations for participants. **Conclusion:** These findings inform future research to identify general and unique smoking risk and protective factors among a larger sample of TGE adults and to develop culturally appropriate interventions to reduce smoking in this population.

FUNDING: Federal

POD51-9

THE ROLE OF SUBJECTIVE SOCIAL STATUS ON CIGARETTE CRAVING AFTER EXPOSURE TO POINT OF SALE TOBACCO MARKETING

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Significance. Repeated exposure to point-of-sale tobacco marketing (POST-M) with and without discounts might contribute to smoking disparities because cigarette ads and discounts are more prevalent in low-socioeconomic neighborhoods. Subjective social status (SSS) refers to how someone perceives their status relative to others and is a powerful predictor of health outcomes, including smoking. We tested if SSS moderates the relationship between exposure to POST-M and cigarette craving. **Methods.** Two studies (exact replication of methods) examined cigarette craving after exposure to POST-M with discounts (vs. without discounts) in daily smokers. Participants viewed images depicting two rows of a cigarette power wall with cigarette packs from the participant's preferred brand with a multi-pack discount (discount condition) or a brand logo (control), using a within-subject design. On each trial participants viewed 4 unique images from the same condition in a row, then rated their cigarette craving on a 5-point scale. After the image task, participants reported SSS by selecting a rung on a 10-rung ladder indicating where they would place themselves relative to others in the U.S. in terms of money, education, and jobs. **Results.** In study 1 (N=152), craving was significantly higher after exposure to the discount condition (vs. control), $\beta=0.12$, $p<.01$, with particularly strong effects of condition on participants with higher SSS, who craved cigarettes more after POST-M with discounts (vs. control). There was no difference in craving between the POST-M conditions for low SSS participants, who craved more regardless of condition ($\beta=0.10$, $p<0.01$). In study 2 (N=129), craving was significantly higher for low SSS participants than high SSS participants for both conditions, $\beta=-0.16$, $p=.03$. Craving was directionally higher after exposure to the discount condition (vs. control) but the relationship was not significant ($p=0.22$) and not moderated by SSS. **Conclusion.** Exposure to POST-M was associated with higher craving for low SSS participants, regardless of condition. Results suggest that policies reducing point-of-sale cigarette ads are pro-equity by benefitting low SSS smokers. **Funding:** This work was supported by the National Cancer Institute, grant number 1R01CA229305-01A1.

FUNDING: Federal

POD51-10

CORRELATION BETWEEN DISPARITIES IN TOBACCO RETAILER DENSITY AND DISPARITIES IN CIGARETTE SMOKING IN OHIO

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Significance: Growing evidence suggests neighborhood density of tobacco retailers is positively associated with tobacco use. More tobacco retailers are located in neighborhoods with a high concentration of poverty and residents of color. This study examined the association between these disparities in tobacco retailer density (TRD) and disparities in the prevalence of cigarette smoking among adults in Ohio in 2017. **Methods:** We obtained data on licensed tobacco retailers from the Ohio county auditor offices (n=11,392) and data on cigarette smoking from the Ohio Behavior Risk Factor Surveillance System (n=12,289). Retailers were geocoded to determine their location within the state's 10 geographic regions. We defined disparities in TRD as a region's ratio of TRD in high vs. low poverty census tracts (as well as in high vs. low racial/ethnic minority tracts). We defined disparities in cigarette smoking as the ratio of prevalence of smokers in a region living at or below vs. above the poverty threshold (as well as smokers who were non-white vs. white). We estimated the Pearson correlation coefficient

to assess the linear relationship between the TRD disparities ratios and both cigarette smoking disparities ratios. **Results:** The mean disparity in TRD ratios were 1.68 (poverty) and 1.05 (race/ethnicity), and the disparity in smoking ratios were 2.40 (poverty) and 1.22 (race/ethnicity). Poverty-based TRD disparities were significantly positively associated with poverty-based disparities in smoking ($r=0.66$, $p<0.0001$). Similarly, race/ethnicity-based TRD disparities were associated with race/ethnicity-based disparities in smoking ($r=0.49$, $p<0.0001$). **Conclusions:** Disparities in tobacco retailer density by poverty and race/ethnicity are associated with their respective disparities in cigarette smoking among adults in Ohio. To our knowledge, this is the first analysis linking these disparities, underlining the detrimental effect of environmental tobacco exposure on disadvantaged populations.

FUNDING: Federal



FEATURED POSTER SESSION 52:
FEATURED PUBLIC HEALTH POSTERS

POD52-2

CRITICAL CHALLENGES IN QUANTIFYING VAPING BEHAVIOR:
A QUALITATIVE STUDY OF YOUNG ADULTS IN SOUTHERN
CALIFORNIA WHO VAPE

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Significance: Previous studies suggest that young adults who vape experience difficulty when answering questions about their vaping frequency. Investigators have struggled to develop appropriate survey items for quantifying vaping behaviors across the multitude of devices currently on the market that are both easy for participants to answer and that accurately quantify level of vaping exposure. The current study asked young adults who vape to provide suggestions on improving scientific measurement to quantify vaping. **Methods:** We conducted semi-structured qualitative interviews with 62 young adults who vape in Los Angeles, CA between June 2018 and June 2019. The interview guide was open-ended and elicited information on participants' thoughts, feelings, and experiences related to vaping. Here, we conducted a thematic content analysis on participants' responses to the following question: "What do you think is the best way for us to understand how much people vape?" **Results:** We identified three themes commonly mentioned by participants regarding the challenges of accurately quantifying vaping. First, many participants struggled to answer the question, and appeared to not actively monitor their vaping behavior and exposure levels. Second, participants discussed the variety of currently available devices and suggested that survey measures should be device-dependent (e.g., separate items for pod-based devices vs. open system devices). Finally, participants noted that vaping patterns (e.g., puff size, puff duration, frequency of use per day) vary across vapers regardless of the type of device used, which may impact data accuracy. In addition, several promising suggestions were made for better measures, which we plan to test in future research. **Conclusion:** This study provides perspectives from young adults who vape on accurately quantifying vaping behaviors. The lack of self-monitoring of vaping behavior contrasts sharply with the cigarette literature, where cigarette use is standardized and generally reliably recalled (e.g., "X packs per day"). Future research must further refine survey measures to more accurately quantify vaping behavior.

FUNDING: Federal

POD52-3

WHAT KIND OF SMOKING IDENTITY FOLLOWING QUITTING
WOULD ELEVATE SMOKERS RELAPSE RISK. FINDINGS FROM
THE ITC AUSTRALIA AND UK SURVEYS

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Significance: Research has suggested that smokers who quit smoking and continue to identify themselves as a smoker are at a greater risk of relapse than their counterparts who now describe themselves as either a non-smoker or an ex-smoker. It was unclear whether there are more nuanced differences. This study examines the relationship between post-cessation smoker identities and relapse risk of former smokers in Australia and the UK comparing those who identified themselves as either a non-smoker, an ex-smoker, or a smoker with a firm choice to no longer smoke versus those without expressing a firm choice (i.e., a smoker trying to quit smoking). Cross-country differences were examined. **Methods:** Data analysed came from 544 former smokers (quit 1 month or more) who participated in the International Tobacco Control (ITC) Australia and UK Waves 9 (2013) and 10 (2014) Surveys. Logistic regression models were used to examine prospectively the association between post-cessation smoker identities assessed at baseline and smoking relapse assessed at follow-up. **Results:** Baseline self-reported smoker identity independently predicted smoking relapse at 12-month follow-up ($p < .01$). Compared with the subgroup who identified themselves as smokers trying to quit, those who identified themselves as smokers who had chosen to no longer smoke (odds ratio [OR]=.01, 95% confidence interval [CI]=.01-.25, $p < .001$), ex-smokers (OR=.05, CI=.01-.25, $p < .001$) or non-smokers (OR=.07, CI=.02-.37, $p < .001$) were less

likely to relapse at follow-up. No cross-country differences were found. **Conclusions:** Following quitting, smokers who maintained a smoker identity with a firm choice to no longer smoke or adopted a non-smoker or ex-smoker identity were less likely to relapse than those who failed to do so, suggesting that a clear rule/commitment to not smoke and/or a shift to a non-smoking identity may be protective of relapse.

FUNDING: Federal

POD52-4

IMPACT OF SELF EFFICACY ON DAILY INTENTION NOT TO
SMOKE

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Significance: To improve cessation interventions, it is necessary to identify and understand the factors associated with daily motivation to not smoke. One factor that has been hypothesized is baseline self-efficacy or confidence in one's ability to abstain from smoking. However, there is a lack of evidence examining self-efficacy as a dynamic construct. This study examined the influence of baseline and daily self-efficacy on daily intentions to not smoke in smokers who were motivated to quit sometime in the future (i.e., in the contemplation stage). **Methods:** Current smokers (N=76, 51.5% female, age= 42.2 ± 12.2 years) completed measures of SE at baseline, and each evening during 28 days of ecological momentary assessment. Daily intention to not smoke (yes/no) was assessed each morning, and number of cigarettes was assessed each evening. GLMM controlling for sex, age, and nicotine dependence, was used to test if a daily measure of self-efficacy is more predictive than a baseline measure in predicting non-smoking intention. **Results:** Overall participants smoked on 91.8% (SD=0.27%) of days. Participants intended to not smoke on 45.0% (SD=0.33%) of days but were only successful on 16.87% (SD=0.37%) of days. Baseline SE was not correlated with mean daily rating of SE ($r=0.18$, $p=0.13$) or variance in ratings ($r=-0.10$, $p=0.40$). People who had higher baseline SE were 2.3% more likely to set a non-smoking intention ($p=0.30$) while people who had a higher rating of SE on a previous night were 67.8% more likely to set a non-smoking intention ($p=.002$) on any given morning. Participants were 66% less likely to set an intention if they smoked on the previous day ($p=.009$) but were 288% more likely to set an intention again if they had set one on the previous day ($p>0.001$). **Conclusion:** The current data indicates that both overall and day-to-day fluctuations in SE influence daily intentions to not smoke in smokers who are interested in - but not yet ready to -quit. Future intervention research could examine the addition of methods designed to increase and maintain a person's daily self-efficacy and how this can be leveraged to encourage these smokers to attempt long-term cessation.

FUNDING: Nonprofit grant funding entity

POD52-5

SMOKING ATTITUDES AND BEHAVIORS FOLLOWING LUNG
CANCER SCREENING ASSESSING SHORT TERM CHANGES
AMONG PARTICIPANTS IN A TELEPHONE BASED CESSATION
TRIAL PRIOR TO TOBACCO TREATMENT

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Significance: In the U.S., approximately 4 million current smokers are at high-risk for lung cancer and are eligible for lung cancer screening (LCS) via low-dose computed tomography. Undergoing LCS and receiving the screening result may promote an increase in motivation to quit as well as a reduction in smoking. Prior to the cessation intervention as part of the Lung Screening, Tobacco, and Health randomized controlled trial, we examined whether smoking attitudes and behaviors changed following LCS. **Methods:** Participants (N=731) completed two phone assessments: pre-LCS (T0) and post-receipt of their LCS results (T1). Both interviews preceded randomization and assessed cigarettes per day (CPD), nicotine dependence, readiness to quit, confidence and motivation to quit, and perceived risk of lung cancer. At T1, we assessed the impact of the screening results on participants' desire to smoke. Changes were assessed using McNemar and paired t-tests. **Results:** The mean age of participants was 63.7 (SD=5.9) years, 90% were White, 51% were female, 36% had a high school degree/ GED or less, and 40% were undergoing their first LCS exam. Regarding tobacco-related characteristics, 90% smoked daily and 27% smoked within 5 minutes of waking. The



median time between screening and the T1 was 14 days. There was a reduction in CPD between the T0 (M=18.4, SD=8.9) and the T1 (M=16.8, SD=8.8; $p < 0.001$). Post-receipt of LCS results, 36% reported increased readiness to quit, 12% reported decreased readiness, and 52% had no change ($p < 0.001$). Motivation to quit increased between assessments ($p < 0.05$). Following screening, 20% reported increased perceived risk of lung cancer, 19% reported decreased risk, and 61% reported the same level of risk ($p < 0.05$). At T1, 54% reported a decreased desire to smoke, 3% reported an increased desire, and 44% reported no change. Compared to those returning for an annual LCS, those undergoing their first scan were more motivated to quit and had greater perceived risk for lung cancer (p 's < 0.05). **Conclusion:** The time between registering for LCS and receiving the results may be an important period to engage smokers in cessation, when many report changes to smoking and perceived risk. This window may be particularly important among those undergoing their first scan who may be experiencing a heightened response to a health event.

FUNDING: Federal

POD52-6

EXPOSURE TO E-CIGARETTE ADVERTISING AND ITS ASSOCIATIONS WITH CURIOSITY AND SUSCEPTIBILITY TO E-CIGARETTE USE AMONG US YOUTH IN 2019

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Significance: While a substantial proportion of US youth was exposed to e-cigarette advertising in 2014-2016, it is unclear what proportion of tobacco-naïve US youth was exposed to e-cigarette advertising since the dramatic increase of e-cigarette use due to pod-based e-cigarettes (e.g., JUUL), and how it relates to curiosity and susceptibility to e-cigarettes use among US youth. **Methods:** Data were from US middle and high school youth who never used any tobacco products and participated in the 2019 US National Youth Tobacco Survey (n=10,820). They reported how often they saw e-cigarette advertisements on the Internet, in magazine/newspapers, at retail locations, and on streaming services (e.g., Hulu) and in movies. Curiosity and susceptibility to e-cigarettes use were also assessed. Weighted multivariable regression models were used to examine associations between: [1] demographics, exposure (yes/no) and frequency of exposure (1=never to 5=always) to e-cigarette advertising through each channel and across all channels; [2] exposure to e-cigarette advertising and curiosity and susceptibility to e-cigarette, adjusting for demographics. **Results:** Overall, 86% tobacco-naïve US youth were exposed to e-cigarette advertising through one of these channels in 2019. High school and female students were more likely to be exposed and at a higher frequency to e-cigarette advertising through all channels than middle school and male students ($p < 0.05$). Non-Hispanic Black students were more likely to be exposed and at a higher frequency than non-Hispanic White students through streaming services/movies ($p < 0.05$). Exposure to e-cigarette advertising, as well as higher frequencies of exposure, were associated with higher odds of being curious of and susceptible to e-cigarettes use ($p < 0.05$), especially among middle school students (middle vs. high school interaction $p < 0.01$). **Conclusions:** Most tobacco-naïve US youth were exposed to e-cigarette advertising. This exposure was associated with curiosity and susceptibility to e-cigarette use. Given the detrimental effect of e-cigarette use among youth, effective regulations are needed to eliminate youth exposure to e-cigarette advertising.

FUNDING: Federal

POD52-7

CHARACTERISTICS OF ADULT USERS OF HEATED TOBACCO PRODUCTS: FINDINGS FROM THE 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: Contemporary heated tobacco products (HTPs) have further diversified global tobacco markets. Characteristics of HTP users in real world settings remain understudied. We evaluated associations between current HTP use and sociodemographics, nicotine-related perceptions, and patterns of polyuse among current and former smokers (18+ years) in four countries. **Methods:** Data were from current smokers,

former smokers, or nicotine vaping product (NVP) users from the United States, Canada, England, and Australia (n=12,987) who participated in the 2018 ITC Four Country Smoking and Vaping Survey. Unweighted descriptive statistics were used to characterize current-monthly HTP users (n=443). Weighted logistic regression analyses assessed correlates of HTP use, controlling for sociodemographics, country, and current-monthly smoking and vaping status. **Results:** HTP users had a mean age of 31.1 years (non-HTP users: 44.7; $p < 0.001$) and two-thirds fell in the highest SES category (67.7%). Most HTP users concurrently used both cigarettes and NVPs (89.8%). Among these polyusers (smoking+NVP+HTP; n=398), 83.5% smoked daily, 68.0% vaped daily, and 41.1% used HTPs daily. In multivariable regression (aOR [95%CI]), past 30-day use of other combusted tobacco products (i.e., cigars) was associated with HTP use (8.62 [5.45-13.63]). Among cigarette smokers (n=10,281), planning to quit within 6 months (2.54 [1.74-3.71]) and reporting a quit attempt in the last 18 months (1.60 [1.08-2.36]) were positively associated with HTP use. Among vapers (n=4,615), experiencing negative side effects from vaping (6.52 [4.55-9.36]) and perceiving vaping as similarly or more harmful than smoking (2.33 [1.63-3.33]) were positively associated with HTP use. **Conclusion:** In this sample of adult current and former nicotine users, current-monthly HTP use was more common among those who were younger and more affluent, and most HTP users concurrently smoked and vaped daily. Smokers using HTPs appeared more interested in quitting smoking, and vapers using HTPs had experienced negative side effects from NVPs. Characteristics of HTP users may yield insight for future regulatory treatment of these products.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POD52-8

PREVALENCE OF HEATED TOBACCO PRODUCT USE AMONG MEXICAN SMOKERS AND VAPERS

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Background: Heated tobacco products (HTPs) are purportedly less harmful than cigarettes, and could potentially play a role in offering a potentially-modified risk alternative for smokers. We examined the prevalence and correlates of current HTPs use among smokers and vapers in Mexico, a country that has banned HTPs imports, but that allows the sale of IQOS. **Methods:** Data are from two waves, November 2019 (n=1390) and March 2020 (n=1351) of an online survey of adult exclusive smokers and dual users. Participants included those who completed the first survey as well as new participants who participated in the second survey (replenishment survey to account for attrition). Self-reported measures included: sociodemographics, current use of HTPs, smoking and vaping frequency (i.e. dual sporadic and frequent user, e-cigarettes use less than once a week and at least once a week, respectively), intentions to quit smoking, smoking, vaping and HTPs use by family/friends, perception of HTPs harmfulness relative to cigarettes, exposure to information related to HTPs. Multilevel mixed-effects logistic regression models were estimated to account for repeated measures for cohort respondents, regressing current HTPs use on study variables. All data were weighted by sex, age, education, and smoking/vaping status of the general population of Mexican smokers. **Results:** Prevalence of HTP use was in 2019=0.74% & 2020=0.58% (not significantly differ between waves, $p=0.53$). Current use of HTPs was significantly higher among those aged 30-39 (AOR 0.31, 95%CI 0.12-0.78), and having a higher educational attainment (AOR 4.45, 95%CI 1.36-14.50). Dual users sporadic (AOR 8.74, 95%CI 2.95-25.92), and frequent (AOR 9.83, 95%CI 2.76-35.04) were more likely to be HTPs users compare to exclusive smokers. Those have friends/family users of e-cigarettes (AOR 5.92, 95%CI 1.73-20.28) and HTPs (AOR 4.93, 95%CI 1.59-15.34) were more likely to be HTPs users compare to those who did not have friends/family using them. Exposure to information about HTPs outside retail shops also was associated. **Conclusion:** Fewer than one percent of smokers in Mexico use an HTP; however, smokers who also vape were more likely to report using them to compared to exclusive smokers. **Founding information:** 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.

FUNDING: Federal



POD52-9

ETHNIC DIFFERENCES IN THE TRAJECTORIES OF E-CIGARETTE MARKETING EXPOSURE, E-CIGARETTE USE, AND CIGARETTE SMOKING AMONG ASIAN/PACIFIC ISLANDER YOUNG ADULTS

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Commonly categorized with low-risk "Asian" groups, Native Hawaiian and other Pacific Islanders (NHOPI), who are indigenous to Hawaii and the Pacific Islands, are at high risk for tobacco product use, including e-cigarettes. We tested whether NHOPI are more likely to show growth in e-cigarette marketing exposure over time and whether the increase in e-cigarette marketing exposure is associated with increase in e-cigarette use and cigarette smoking. Prospective survey data were collected from 2335 young adult college students [18-25 years old at baseline; 55% women; 20% NHOPI, 19% Filipino, 26% East Asians (Japanese, Chinese, Korean), 24% White, 11% Other] at 4 time-points in 6-month intervals. E-cigarette marketing exposure was assessed based on the cued-recall method and point-of-sale exposure. Latent Growth Curve Modeling was used to test the hypotheses. Significant positive growth trajectories were found for e-cigarette marketing exposure and current e-cigarette use over time. NHOPI ethnicity (relative to White) at baseline was significantly associated with the factor signifying the increase in e-cigarette exposure over time, which in turn was associated with growth factor indicating increase in e-cigarette use over time. Increase in e-cigarette marketing exposure over time was not associated with cigarette smoking. Filipino ethnicity (relative to White) was inversely associated with increase in e-cigarette marketing exposure whereas Asian ethnicity was not associated with the increase in e-cigarette marketing exposure at all. The association between NHOPI ethnicity and increase in e-cigarette use over time is likely to be explained by increased exposure to e-cigarette marketing over time. Higher exposure to e-cigarette marketing may be associated with disparities in e-cigarette use between NHOPI and other Asians. Tobacco product marketing is likely to target social disadvantaged and marginalized ethnic groups. Counter-marketing efforts may need to target indigenous populations, included NHOPI.

FUNDING: Federal

POD52-10

SEXY, TRASHY, COOL: PERCEPTIONS OF CIGARETTES AND E-CIGARETTES ACROSS DEMOGRAPHIC GROUPS

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E-cigarette use is increasing, particularly among young adults, while cigarette use has declined. However, cigarettes are still a top cause of preventable death in the U.S., and e-cigarette use has been associated with cigarette uptake. Rates of cigarette and e-cigarette use are even higher among military personnel, who have a long history of targeting by tobacco companies. Several studies have assessed perceptions and attitudes towards cigarettes and e-cigarettes, but they typically are limited to perceptions of harm. Additionally, studies have not assessed differences in cigarette and e-cigarette attitudes among gender, ethnic, and racial minorities, the latter of whom also have a history of being targeted by tobacco companies. The current study aimed to assess gender (male and female), ethnic (Hispanic and non-Hispanic), and racial (White and non-White) differences in potential positive (e.g., sexy, cool, clean) and negative (e.g., trashy, disgusting) attributes related to cigarettes and e-cigarettes, and their relationship to past 30-day tobacco use. Participants (N=3,374) were young adult (mean age = 20.5) members of the U.S. Air Force who completed a survey about their tobacco use and beliefs. Results indicated that White individuals were more likely to endorse negative attitudes towards cigarettes and positive attitudes towards e-cigarettes compared to non-White individuals ($p < .001$). Women were more likely to endorse negative attitudes towards cigarettes and e-cigarettes ($p < .001$), while men were more likely to endorse positive attitudes towards cigarettes and e-cigarettes ($p < .001$). Differences between Hispanic and non-Hispanic participants were non-significant ($p > .05$). Endorsement of either positive or negative e-cigarette or cigarette attitudes was associated with past 30-day use of the corresponding product, controlling for race, age, gender, and ethnicity ($p < .001$). Results indicate racial and gender differences in perceptions of cigarettes and e-cigarettes and show the impact of attitudes (negative and positive) on actual use. It may be that exposure to cigarette/e-cigarette messages promotes saliency of products, leading to increased use.

FUNDING: Federal

FEATURED POSTER SESSION 53: FEATURED CLINICAL POSTERS

POD53-1

CHANGES IN DEPENDENCE, WITHDRAWAL, AND CRAVING AMONG ADULT SMOKERS WHO SWITCH TO NICOTINE SALT POD-BASED E-CIGARETTES

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Significance: Complete switching from combustible to electronic cigarettes (ECs) reduces harm to the user. For ECs to be a viable substitute, they need to be rewarding enough for regular use, indicated by factors such as craving and dependence (i.e., reinforcement profile). However, little is known about short-term changes in reinforcement value across trajectories of EC use. We assessed these factors during a 6-week switching trial. **Methods:** Participants were randomized 2:1 to switch to a nicotine salt pod system EC or continue smoking (assessment-only control) in a 6-week trial. 114 African American ($n=60$) and Latinx ($n=54$) smokers were randomized to receive ECs and are included in the current investigation. At week 6, participants were classified by use trajectory: exclusive smokers ($n=16$), exclusive EC users ($n=32$), or dual users ($n=66$). Participants reported on their EC, cigarette, and total nicotine dependence (cigarette + EC dependence), cigarette and EC use, and nicotine craving and withdrawal at baseline and week 6. Cotinine and exhaled carbon monoxide were assessed at baseline and week 6. **Results:** Participants who completely switched from smoking to ECs (exclusive EC users) and those that partially switched (dual users), maintained cotinine levels ($p > .05$) and showed reductions in cigarette dependence and withdrawal ($p < .01$). However, exclusive EC users showed no significant changes in total nicotine dependence from baseline to week 6 ($p = .123$), while dual users showed increased total nicotine dependence ($p < .001$). Dual users displayed similar levels of EC dependence as exclusive EC users but a lesser reduction in cigarette dependence. Exclusive EC users and dual users showed reductions in craving and withdrawal from baseline to week 6. **Conclusions:** The current study is among the first to prospectively examine changes in dependence, craving, and withdrawal among an understudied sample of smokers making a switch attempt. Smokers who completely switch to nicotine salt pod system ECs maintain nicotine levels and dependence, suggesting that pod-based ECs have a similar reinforcement profile to cigarettes and facilitate switching.

FUNDING: Federal

POD53-2

EXPLORATORY EVALUATION OF ONLINE BRIEF EDUCATION FOR JUUL POD-MOD USE AND PREVENTION

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Significance: Initiation of pod-mod e-cigarette use by young adults is one of the most significant public health issues within the debate on vaping. The current study examined the effect of brief educational information among young adults and investigated outcomes as a function of JUUL use and smoking status. **Methods:** Participants ($N=947$) were young adults (<30 years old) recruited from Amazon's Mechanical Turk based on smoking and JUUL use status. Participants completed baseline assessments, viewed a brief JUUL educational handout, and completed post-assessments. **Results:** There was a significant Time X Group interaction for JUUL-related knowledge ($p < .001$), with never JUUL/never smokers showing the greatest increase in knowledge. Brief education increased JUUL-related knowledge, risk perceptions, commitment to quitting, and readiness to quit JUUL (all $p \leq .001$; time x group $p > .05$ for all contrasts except JUUL-related knowledge). Participants showed decreased interest in future JUUL use, interest in purchasing JUUL, and interest in future regular use (all $p \leq .001$; time x group $p > .05$ for all contrasts). In terms of smoking outcomes, participants reported reduced perceived harm to others ($p < .001$) and decreased intentions to smoke regularly ($p = .001$). **Conclusions:** Brief education was effective in increasing knowledge and risk perceptions while reducing intentions for future use. The information was most effective



in increasing knowledge among non-users, suggesting that brief education may be useful for preventing pod-mod initiation. Analysis of group differences suggest current JUUL use status is more important in informing JUUL-related attitudes than smoking status.

FUNDING: Federal; Academic Institution

POD53-3

COMPARING PROSPECTIVE PREDICTION OF CESSATION OUTCOMES FROM FOUR COMMON MEASURES OF DEPENDENCE IN A LARGE CLINICAL TRIAL OF YOUNG, TREATMENT-SEEKING E-CIGARETTE USERS

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Background. Multiple self-report measures for nicotine dependence in e-cigarette users exist. Scales include the 4-item PROMIS-e and the 10-item HONC. "Daily-Vaping" and an adapted "time to first" (TTF) item for vaping have been used as proxies for dependence. We compared the association of these measures with abstinence and their utility in classifying vaping outcomes among e-cigarette users enrolled in a cessation trial. **Method.** Young adult vapers interested in quitting (aged 18-24; N=2,588) were recruited by web ad. HONC, PROMIS-e, TTF, and Daily-Vaping were assessed at baseline. Item Response Theory with HONC and PROMIS-e generated two liability scores for each user. TTF was analyzed as a 4-level variable. Dichotomous self-reported outcomes at 1-month included 7-day abstinence and reduction in vaping days/week among continuing users. **Results.** Response rate was 79% (n=2057). Half the sample (49%) vaped ≤ 5 minutes of waking; 93% vaped daily. At 1-month, 34% were abstinent and 55% had reduced vaping. Liability scores from HONC were continuously and symmetrically distributed, with some evidence of ceiling effects. Liability scores from PROMIS-e were semi-continuous, with 37% of participants receiving the highest possible score (compared to 6% from HONC). Versions of HONC, PROMIS-e, and TTF standardized by their inter-quartile range (IQR) performed similarly across outcomes. All three were bivariate associated with abstinence (ORs 0.75 to 0.83) and consumption (ORs 0.64 to 0.73); classification accuracy was above chance for both abstinence (AUC 0.54 to 0.56) and reduction (AUC 0.57 to 0.59). Daily-Vaping was associated with abstinence (OR=0.42) but not with reduction (OR=1.04); it was not useful for predicting abstinence (AUC=0.47) or reduction (AUC=0.50). **Conclusions.** HONC, PROMIS-e, and TTF are roughly equivalent in their prospective associations with and classification of vaping abstinence and reduction. Although Daily-Vaping was associated with abstinence, it showed poor discrimination. Additional findings suggest that dichotomous measures of nicotine dependence may be more useful for studies of association, such as population surveillance, than for prediction purposes, such as clinical decision-making for individual treatment. Identifying contexts where researchers should prioritize association versus classification is discussed.

FUNDING: Nonprofit grant funding entity

POD53-4

UTILIZING AUGMENTED REALITY CUES TO ELICIT CRAVINGS TO SMOKE

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Smoking-related cues reliably provoke cravings to smoke and can be extinguished in the laboratory. However, extinction tends not to generalize to smokers' natural environment, limiting the efficacy of cue-exposure therapy for smoking cessation. Augmented reality (AR) via smartphone provides an opportunity to overcome this limitation. AR inserts 360-degree digital cues into a smoker's real-world, introducing the possibility of conducting extinction trials in the natural environment. The first step toward using AR smoking cues for extinction-based therapy is to verify that smoking-related cues generated by AR are realistic enough to elicit cue reactivity (CR). Therefore, we created 6 smoking-related AR cues (e.g., cigarette in ashtray) and 6 neutral AR cues (e.g., office supplies), and we compared reactivity to these cues versus similar in vivo cues using a 2 (smoking vs neutral) X 2 (AR vs neutral) within-subjects design. On 10-point Likert scales, participants (N=17; 71% female; mean age=50.41) rated their craving to smoke in response to all 6 cues, which were repeated semi-randomly 4 times for a total of 24 cues, as well as the perceived reality and user and environmental co-existence of the AR cues. CR was assessed by comparing urge ratings in response to smoking-related cues versus neutral cues. Smoking-related AR cues were generally perceived as being realistic (M=7.16, SD=2.23) and well-integrated into both the environment (M=7.12,

SD=2.24) and the user's experience (M=7.04, SD=2.22). As hypothesized, we found large CR effects for AR cues (Z=3.44; P=.001; d=1.37). CR to in vivo cues was also found (Z=3.41 P=.001; d=1.64) at a slightly higher magnitude than AR reactivity (Z=2.67, P=.008; d=.36). This study demonstrated that digitally-created smoking stimuli, as viewed through a smoker's smartphone via AR technology, were perceived as realistic and that they elicited cravings at magnitudes approaching those of actual in vivo smoking stimuli. These findings support the potential of AR both for CR research conducted in smokers' natural environments and for their use in extinction-based cue-exposure therapies conducted in that same environment.

FUNDING: Federal; Academic Institution

POD53-6

AN 18-MONTH SMOKING CESSATION INTERVENTION INCORPORATING PHARMACOTHERAPY AND BEHAVIORAL COUNSELING DELIVERED IN COMMUNITY MENTAL HEALTH SETTINGS IMPROVES TOBACCO ABSTINENCE RATES IN ADULTS WITH SERIOUS MENTAL ILLNESS: RESULTS OF A RANDOMIZED CLINICAL TRIAL

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Significance: Tobacco smoking is the largest contributor to cardiovascular mortality disparity among those with serious mental illness (SMI). Combined pharmacologic and behavioral treatments improve tobacco abstinence rates, but the most effective evidence-based treatments are under-utilized for those with SMI, and cessation efforts tend to target the minority of smokers ready to quit right away despite recommendations to offer treatment to all smokers. Weight gain often accompanies abstinence. **Methods:** To test the effectiveness of an 18-month smoking cessation intervention, 192 adult daily tobacco smokers with SMI were enrolled and randomized, stratified by readiness to quit in 1 month or 1-6 months, to be offered 18 months of community delivered 1st-line cessation pharmacotherapy, smoking cessation counseling tailored to readiness to quit, weight management counseling and support for physical activity or a quit line referral. **Results:** Participants were mean(SD) 49.6(11.7) years old, smoked 12.1(9.5) cigarettes/day; BMI 32.0(7.6) kg/m²; 51% female, 48% African-American, 62% willing to quit in 1 month. At 18-months, 95% of participants provided data, 27.8% of those assigned to the intervention and 6.3% of controls achieved biochemically verified 7-day point prevalence smoking abstinence (p<0.0001); adjusted odds ratio 6.0 (95% CI: 2.3 -15.6; p=0.0002). There was no significant modification of intervention effect on abstinence by readiness to quit. Mean difference in weight change over 18m between active and control was not significant (3.5 lbs, 95% CI: -3.3 -10.3; p=0.32). **Conclusion:** Offering 18 months of evidence-based smoking cessation treatment to adult smokers in a community mental health setting substantially increased tobacco abstinence rates without significant weight gain. Offering guideline concordant best practice smoking cessation treatment to all smokers with SMI, regardless of readiness to quit right away or in 6 months is likely to improve CVD health in this high-risk population.

FUNDING: Federal

POD53-7

EFFECTS OF SHORT-TERM NICOTINE DEPRIVATION ON DELAY DISCOUNTING AMONG YOUNG E-CIGARETTE USERS

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Background: Earlier delay discounting (DD) studies have demonstrated that cigarette smokers deprived of nicotine show greater discounting of delayed rewards (i. e., greater impulsivity) than when they are allowed to smoke (i. e., sated). Prior studies have explored DD rates among e-cigarette users when sated. However, no study has systematically assessed the impact of nicotine deprivation on DD rates among young e-cigarette users. This study aimed at exploring whether acute nicotine abstinence affects choices of two commodities (money and e-liquid) among e-cigarette users. **Methods:** Thirty-one young exclusive e-cigarette users (76% male; 19.1 years old) participated in three laboratory sessions (baseline, and sessions 1 and 2). At each session, they completed two DD tasks: one task assessed choices between various amounts of



money (M vs M) and the other assessed choices between e-liquid now vs. money later (mL-M). Nicotine abstinence (12 h) was verified using levels of breath carbon monoxide and urinary cotinine. Results. Repeated measures ANOVA revealed a significant effect of time for the M-M task, indicating significant changes over time in DD rates for money ($p < .001$). Post hoc analyses showed that AUC scores were larger at sessions 1 and 2 compared to the baseline ($ps < .05$). Analyses also revealed a significant effect of time for the mL-M ($p < .001$). Post hoc analyses showed that AUC scores were lower at session 1 ($p < .05$) compared to the baseline. Discussion: Acute nicotine abstinence increased the preference for small amounts of nicotine (i.e., e-liquid) delivered immediately over alternative reinforcers (i.e., money) that are available after a delay, but decreased impulsive choices for immediate monetary rewards over larger, more delayed amounts of money. Our results suggest that young e-cigarette users in nicotine withdrawal may engage in more impulsive behaviors when that behavior is related to vaping. Our results have important implications for e-cigarette cessation programs. Abstinence-based contingent management programs could be a good approach for e-cigarette cessation only if providing large rewards for immediate e-cigarette abstinence.

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POD53-8

INVESTIGATING THE IMPACT OF OPIOID AGONIST TREATMENT ON NICOTINE METABOLITE RATIO AMONG VULNERABLE SMOKERS

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Significance: Nicotine Metabolite Ratio (NMR) is a biomarker of nicotine clearance. Higher NMR is associated with heavier smoking, greater lung cancer risk, and decreased tobacco cessation. Roughly 20% of variability in NMR is attributable to environmental factors, and some data suggest that medications may influence NMR. Individuals with Opioid Use Disorder bear a disproportionate burden of smoking-related morbidity and mortality, and it is unclear whether opioid agonist treatments (OAT), such as methadone (MTD) and buprenorphine (BUP), influence NMR. **Methods:** This was a secondary analysis of data from a randomized controlled trial examining the effects of reduced nicotine content cigarettes on cigarette smoking among vulnerable populations. We used simultaneous multiple regression to compare square-root transformed baseline plasma NMR between smokers maintained on methadone or buprenorphine (Opioid Agonist Treatments, OAT) vs. smokers not receiving OAT adjusting for demographic characteristics and use of medications known to influence NMR. Analyses were repeated with a three-category predictor variable comparing BUP vs MTD vs non-OAT smokers. **Results:** Overall, participants ($N=440$, 55.2% female) smoked 18.7 ± 9.6 cigarettes per day and with a mean baseline Fagerstrom total score of 5.8 ± 2.4 , indicating moderate dependence severity. OAT ($n=193$) and non-OAT ($n=247$) smokers did not differ on NMR in the primary analysis (0.48 ± 0.2 vs. 0.48 ± 0.3 , respectively; $b = 0.02$, $p = 0.30$) although in the three-category analysis, NMR was higher among individuals receiving MTD ($n=92$, 0.54 ± 0.2) vs. those receiving BUP ($n=101$, 0.43 ± 0.2 , $p = .01$) or non-OAT individuals (0.48 ± 0.3 ; $p = .03$). In both analyses, older age, lower BMI, use of estrogen medication, and being of non-Latino White race were associated with higher NMR ($ps < .05$). **Conclusion:** We do not see evidence that OAT smokers generally have elevated NMR but receiving MTD may have elevated NMR. As higher NMR has been associated with greater nicotine dependence and poorer cessation and health outcomes, MTD-maintained smokers may require more intensive smoking cessation interventions for favorable outcomes.

FUNDING: Federal

POD53-10

SMOKING DEPRIVATION CONDITION AND TRAIT ANXIETY INTERACT TO PREDICT VARIABILITY IN SMOKING TOPOGRAPHY DURING AN EXPERIMENTAL RELAPSE ANALOG TASK

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Significance: Cigarette smokers with elevated anxiety experience greater quit difficulty and likelihood of relapse. Additionally, smokers with elevated anxiety may evince greater variability in how they smoke (i.e. puff topography), which is associated with worse nicotine dependence. Yet, no work has examined how anxiety may impact smoking behavior differentially across periods of smoking abstinence and non-abstinence. Therefore, the current study utilized puff level topography to examine how trait anxiety impacts smoking behavior during deprivation. **Method:** Thirty-nine daily cigarette smokers were randomly assigned to two counterbalanced visit types (abstinent and non-abstinent) during which the Relapse Analog Task was completed. Topography data, including puff volume, duration, and inter-puff interval were collected during the RAT using the Clinical Research Support System. Three-level multi-level models examined within-person (a) mean topography and (b) variability in topography, while controlling for the effects of CO and nicotine dependence. **Results:** There was no main effects for visit type for puff volume, but there was a significant visit type by anxiety interaction, whereby higher anxiety was associated with greater mean puff volume in the abstinent condition. Mean puff duration was greater during the abstinent condition, but there was no significant interaction with anxiety. There were no mean differences by visit type for inter-puff interval. In terms of variability, there was greater puff volume variability in the abstinent relative to non-abstinent condition. For puff duration, there was a significant interaction, such that anxiety was associated with greater variability in puff duration for the non-abstinent condition. Finally, for inter-puff interval, there was a significant visit type by anxiety interaction, whereby anxiety was associated with greater variability in inter-puff interval for the non-abstinent condition. **Conclusion:** Anxiety may be a particularly important predictor of variability in smoking behavior during abstinence. Targeting unique puffing behavior among smokers with elevated anxiety may be important to improving cessation outcomes.

FUNDING: Federal

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of responding, suggesting that policies to regulate flavors in all ENDS device types 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

POD54-1**JUUL RELEASES NEW TECHNOLOGY PRODUCTS WITH A HIGHER EMISSIONS PROFILE**

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The JUUL electronic cigarette (ECIG) emerged in 2015 and quickly became one of the top-selling ECIGs in the USA. JUUL's popularity is likely due to its use of a salt-based, high nicotine concentration liquid, compact form, and temperature-regulation technology. In 2019, JUUL Labs released new JUULpods in the market labelled 'New Technology'. JUUL Labs claim that the new technology pods use cotton rather than a silica wick, offering 'more consistency puff-to-puff' and higher delivery of 'nicotine per puff and more vapour depending on usage patterns'. In this study, we compare the electrical characteristics, liquid composition, and aerosol emissions of new and previous generation JUUL pods procured in the UK in July, 2020. We measured device geometry and electrical characteristics, including voltage versus time during a puff for new and previous generation JUUL pods. We also compared the liquid composition (PG/VG, nicotine concentration, and pH), and nicotine emissions across the two products. All study outcomes were obtained in triplicate each time using a new pod. We found that the 'new technology' JUUL pods use a different wicking material than the previous pods. We also found that compared to the previous generation, the new pods produced a higher average voltage during a puff and greater nicotine yields. We found no differences in geometry, electrical resistance, and liquid composition. Because the internal temperature-controlled JUUL power circuit delivers a consistently higher average voltage during a puff, it is likely that the new wick design provides better liquid transport to the coil than with the previous generation JUUL pods. The higher average voltage, in turn, results in higher nicotine emissions per puff. The findings of this study suggest that even the most successful ECIG products may continue to morph in a manner that may impact abuse liability, and indicate that regular monitoring of marketed products may be necessary to understand downstream population-wide ECIG use patterns over time.

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POD54-2**DEVELOPMENT OF A NICOTINE AEROSOL SELF-ADMINISTRATION MODEL IN RATS AND THE EFFECTS OF E-LIQUID FLAVORS**

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INTRODUCTION: There are currently no established preclinical models of aerosol nicotine self-administration (ANSA) in which nicotine functions as a reinforcer. 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. Due to the association with sweet tastes, ENDS flavors become conditioned reinforcers for human users. **METHODS:** Rats were first trained to press a lever for liquid sucrose (20% of volume) with 0.25% raspberry flavor or no flavor in a standard operant chamber. Rats were then transferred to aerosol self-administration chambers. Meeting the schedule of reinforcement on the active lever resulted in delivery of aerosolized ENDS liquid containing 3% raspberry flavor and 0, 6, or 12 mg/ml nicotine. Meeting the schedule of reinforcement on the inactive lever had no programmed consequence. The schedule of reinforcement for aerosol delivery began with a fixed ratio 1 (FR1), and was increased across days to an FR3. **RESULTS:** Rats responded similarly for raspberry flavored and unflavored sucrose. Rats also responded similarly for raspberry flavored and unflavored aerosol. This suggests that exposure to raspberry flavored sucrose did not establish raspberry aerosol as a conditioned reinforcer. Aerosol intake was similar for nicotine and vehicle groups; however, vehicle groups were more likely to meet acquisition criteria for aerosol self-administration than nicotine groups. Throughout the aerosol phase, rats responded more on the active than inactive lever, which suggests that the aerosol had some reinforcing properties. **DISCUSSION:** Although development of a preclinical model of ANSA that demonstrates reinforcing effects of nicotine is still in progress, these results indicate that liquid sucrose training and the use of flavors may facilitate ANSA. Aerosolized flavors may enhance acquisition

POD54-3**NICOTINE VAPOR SELF ADMINISTRATION IN MICE**

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Significance: In the US, a decline in tobacco use has been observed in recent years due to increasing awareness of its harmful effects; however, this has been paralleled by an alarming increase in e-cigarette use among never-smokers. Furthermore, the abundant choices of flavor for e-cigarettes make them attractive for non-smokers to initiate the vaping habit. Therefore, the development of a vapor-self administration model is necessary to allow us to better understand how this method of nicotine exposure differentially alters brain circuitry and function. **Methods:** Mice were food restricted to 85-90% of their free-feeding body weight before food training. The mice were trained to press an active lever in an operant chamber to obtain chocolate milk in a 1-hour session. After stable responding was established for food reward, the mice were then provided access to nicotine or vehicle vapor on a fixed ratio 5, time out 20 sec schedule of reinforcement. Blood was collected to assess the level of nicotine's main metabolite, cotinine, following self-administration sessions. Finally, to validate that the mice were actively seeking nicotine during nicotine vapor self-administration, another cohort of mice were pre-treated with the nicotinic receptor antagonist, mecamylamine. **Results:** The mice established reliable food training across 7 days. When provided access to nicotine vapor, the mice actively pressed the lever to deliver vaporized nicotine. Pre-treatment with mecamylamine attenuated lever pressing behavior, demonstrating that the mice were selectively pressing the active lever for the delivery of nicotine puffs. Finally, blood cotinine levels confirmed that the mice were inhaling significant quantities of nicotine during the vapor sessions. **Conclusion:** Taken together, these studies establish a novel protocol for nicotine vapor self-administration in mice, which may be employed to further investigate the effects of e-cigarettes on behavior, lung and brain function.

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POD54-4**CHEMICAL CHARACTERISTICS OF TOBACCO-FREE NICOTINE POUCHES**

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Background: The market for tobacco-free oral nicotine pouches has expanded in the U.S. in recent years. The pH of smokeless tobacco is known to affect nicotine delivery through its influence on the percent of nicotine in the free-base form. However, little is known about the pH of tobacco-free nicotine pouches. **Methods:** Eight brands of nicotine pouches and one brand of snus were selected for chemical analysis to determine their pH in water. The nicotine pouch brands were On! Mint (2mg, 4mg, and 8mg nicotine) produced by Helix Innovations LLC, Dryft Spearmint (4mg and 7mg) produced by Dryft Sciences, Zyn Cool Mint (6mg) produced by Swedish Match, and Velo Mint (2mg and 4mg) produced by R.J. Reynolds (RJR). Camel Snus Mint, also produced by RJR, was selected as a comparator product. Three replicates of 2g of each product were tested for pH in water using a standardized methodology required by the Food and Drug Administration (F.R. Vol. 74, No. 4). To mirror actual use conditions, the pH was also measured for single pouches placed in 20mL of artificial saliva (pH 6.8). **Results:** Mean pH of nicotine pouches varied by brand, with On! and Zyn having the highest pH values of 8.19 and 8.17, respectively. They were followed by Dryft (7.85) and Velo (7.53). Camel Snus had the lowest pH (7.47). Within brands, the pH decreased monotonically with increasing labeled nicotine content for On! (2mg: 8.47, 4mg: 8.17, and 8mg: 7.94). The pH increased slightly with labeled nicotine for Velo (2mg: 7.33, 4mg: 7.48). For Dryft, pH was much higher for the 7mg product (8.17) than for the 4mg product (7.58). In artificial saliva, the pH of Zyn was not lower than in water (8.22) while that of On! was reduced the most (7.41). The pH for Dryft (7.57), Velo (6.89), and Camel Snus (6.89) were reduced to a lesser extent. **Discussion:** The pH of nicotine pouches varied by brand. Brands originating in Europe (Zyn, On!) had pH>7.9 in water that more closely mirrored those reported for Swedish snus. Velo and Camel Snus, both manufactured by RJR, had pH levels that were closer to those reported for American snus and moist snuff (pH<7.9). There were also considerable differences between brands in the effect of artificial saliva on pH, suggesting differences in buffering capacities. Within brand



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variations in pH did not vary with labeled nicotine content in a consistent way. As the availability and use of oral nicotine products increases in the U.S., studies of their pharmacokinetic effects, abuse liability, potential use for smoking cessation, and long-term health impacts are needed.

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POD54-5

HEAVY METALS IN LITTLE CIGARS, CIGARILLOS AND LARGE CIGARS

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Heavy metals are toxic constituents in tobacco, and their analysis is useful to fully understand a tobacco product's health impacts. Although important, heavy metal characterization in cigars has not been widely studied. Therefore, we investigated cadmium and arsenic amounts in filler of little cigars, cigarillos and large cigars, which differ in size, shape, tobacco blends and manufacturing processes, and compared them across subcategories and with cigarettes. Metal concentrations were analyzed using "Triple Quad" ICP-MS. The mean arsenic quantities in little cigars, cigarillos and large cigars are 0.222, 0.225 and 0.201 micrograms per gram, respectively. For cadmium, the mean quantities in little cigars, cigarillos and large cigars are 1.24, 1.30 and 1.54 micrograms per gram, respectively. Little cigars and cigarillos have statistically similar arsenic and cadmium quantities on a per gram basis. Large cigars have the highest and lowest quantities of cadmium and arsenic, respectively; however, both metals in large cigars are statistically similar to little cigars and cigarillos. Furthermore, heavy metal concentrations varied with manufacturers and flavors, although only little cigars were analyzed using flavor data. A high arsenic quantity did not necessarily relate to a high cadmium quantity for a specific manufacturer or flavor and vice versa. Upon comparing these cigar results to cigarettes, cigarette mean arsenic quantity was the highest (0.287 micrograms per gram, *p* is less than 0.05) whereas, mean cadmium quantity was the lowest (1.23 micrograms per gram, *p* is greater than 0.05) of all the product categories. Different tobacco blends, growing locations and agricultural conditions are likely reasons for the observed differences in metal quantities. Overall, mean cadmium quantity is similar across cigar subcategories and cigarettes while mean arsenic quantity is similar within cigar subcategories but statistically different when compared with cigarettes. This work is funded by the Interagency Agreement, 224-10-9022, between the Food and Drug Administration and the Centers for Disease Control and Prevention. The authors have no competing financial interests.

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POD54-6

TOBACCO VARIETAL AND CURING INFLUENCES ON FREE RADICAL PRODUCTION

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Often overlooked by researchers, the specific variety of tobacco used in a tobacco product can have a significant impact on the types and quantities of oxidants and toxicants released when smoked. The main varieties used in commercial cigarettes are burley, bright, oriental, and reconstituted. Commercial cigarettes utilize proprietary blends of different tobacco varieties, additives, and flavorings making analysis and comparisons between products murky. In addition, the curing method (air, sun, flue, or fire cured) of each variety can also impact the characteristics of the final product. In an effort to eliminate some of this variability and look at the impact of individual tobacco varieties on toxicant production, different varieties of organic and non-organic whole leaf burley, bright, or oriental tobacco were purchased, shredded, and machine packed into single blend, additive- and flavor-free cigarettes. Each single blend cigarette was analyzed for gas-phase and particulate-phase free radicals using electron paramagnetic resonance (EPR). Nicotine and nicotine-derived nitrosamine ketone (NNK), a known carcinogen, were extracted from Cambridge filter pads and analyzed. Despite being humidified and packed using the same conditions, the burning and smoldering rates of cigarettes varied widely between varieties. In general, burley tobacco smoked the fastest followed by oriental and bright varieties. On a per gram of smoked tobacco basis, burley tobacco produced more gas-phase free radicals followed by oriental and bright tobacco. Particulate-phase radicals did not show a significant trend when looked at on a per gram tobacco basis. Nicotine content on a per gram tobacco smoked basis was highest in burley followed by oriental and bright. Gas-phase radicals and nicotine

varied over 5-fold and 11-fold, respectively, between tobacco varieties. While most cigarettes are comprised of a blend of different varieties, it appears those with greater ratios of burley tobacco may pose the greatest risk to smokers due to the high levels of oxidants produced.

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POD54-7

NICOTINE AND ALCOHOL CO-ABUSE: DIFFERENTIAL EFFECTS OF NICOTINE AND ALCOHOL ON NEUROIMMUNE FUNCTION

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Significance. Nicotine and alcohol are two of the most commonly co-abused substances with as many as 85% of adults with an alcohol use disorder also using nicotine products. When these drugs are used in combination, rates of several types of cancers along with heart and lung conditions increase substantially. Furthermore, the rising popularity of vaping brings a host of new challenges in understanding co-abuse and its negative health outcomes. Recently, the neuroimmune system has emerged as an important component regulating drug intake. Previous studies have shown that alcohol intake is capable of activating the neuroimmune system via toll-like receptors (TLRs), inducing a pro-inflammatory cascade, and that activation of these same receptors promotes further alcohol intake. By contrast, there is evidence that nicotine is actually anti-inflammatory in the brain. Despite these fascinating differential findings, few studies have assessed nicotine and alcohol in combination for their effects on neuroimmune function. As such, the goal of the current experiments was to (1) determine the effects of nicotine, alcohol, and nicotine+alcohol exposure on expression of neuroimmune proteins in rat brain and (2) determine the effects of neuroimmune activation on nicotine, alcohol and nicotine+alcohol self-administration in rats. **Methods.** For both experiments, adult male and female Long-Evans rats were used. Experiment 1: Rats were exposed to non-contingent nicotine vapor, oral alcohol, or both in daily sessions for 20 days after which brains were extracted for analysis of several neuroimmune proteins. Experiment 2: Rats were trained to self-administer nicotine vapor, liquid alcohol, or have co-access for 2 months. Rats were then treated with the TLR3 agonist poly(I:C) prior to two consecutive regular self-administration sessions. **Results.** In experiment 1, rats exposed to alcohol alone showed a significant increase in expression of TLR3 protein in the nucleus accumbens core. Interestingly, this effect was entirely blocked in rats that were exposed to both alcohol and nicotine. In experiment 2, following activation of TLR3, rats increased self-administration of both nicotine and alcohol. **Conclusions.** Taken together, these findings suggest neuroimmune dysfunction as a possible mechanism supporting nicotine and alcohol co-abuse.

FUNDING: Academic Institution

POD54-8

DOSE AND EFFECT OF E-CIGARETTE VAPE IN AN AIRWAY IN VITRO MODEL

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E-cigarettes evaporate a liquid consisting of glycerol and propylene glycol, which often contains nicotine and flavourants. Many flavourants used in e-liquid have been tested for their toxicological effects for oral use, e.g. in food products, and have a GRAS status: Generally Regarded as Safe for oral use. However, inhaling such compounds could impose health risk because the exposure route is different and pyrolysis products may be formed in the e-cigarette. Identification of the most hazardous flavourants in e-liquids would allow informed decision making by users or regulation by governments. In vitro airway models were used to identify toxicological effects of one of the flavourants occurring in many e-liquid flavours: ethyl maltol. Epithelial cells form the first line of defense for inhaled compounds, many of which deposit in the bronchia. Human bronchial epithelial cells (Calu-3 cell line) were cultured at the air-liquid interface and exposed to vape from e-liquids with or without nicotine (10mg/ml) and with or without ethyl maltol (10mg/ml). Cells were exposed (2 puffs/min, 55ml/puff, 3 sec per puff) once (30 minutes) or twice (60 minutes) per day for 2 consecutive days using a Vitrocell smoking machine (VC1). Exposed concentrations, measured in the air just above the cells, was found to be approximately half of the nominal concentration (based on e-liquid usage). In addition, translocation was measured in the basolateral compartment during the post-exposure period. Other parameters, such as cell viability and epithelial membrane integrity, indicated no effect of the exposure. IL-8 production was affected in exposed cells, which was more pronounced after two exposures per day compared to a single exposure per day. Further characterization of the toxicity will include assessment of other



cytokines. Our data show an effect of exposure to e-cigarette vape, but more testing is required to determine whether nicotine and ethyl maltol may have adverse effects on other parameters or after prolonged exposure. Also, we found translocation of nicotine and ethyl maltol across the cell barrier, which could be an indicator of absorption of these compounds.

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model for studying e-cigarette use, whereas TSE self-administration is a closer model of smoking of tobacco in conventional cigarettes. We need to mention which one, nicotine alone or TSE containing nicotine, is more addictive.

FUNDING: Nonprofit grant funding entity

POD54-9

EFFECTS OF ADOLESCENT NICOTINE EXPOSURE ON THE SPONTANEOUS ACQUISITION OF NICOTINE SELF-ADMINISTRATION DURING ADULTHOOD IN RATS

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Significance: Tobacco use is on the decline among US adults, but electronic-cigarettes use has increased alarmingly among young people in recent years. It is possible that adolescent nicotine use can lead to a greater risk for becoming a regular smoker and developing a nicotine addiction later in life. Therefore, we investigated if early- and mid-adolescent (postnatal day (P) 24-42) nicotine exposure enhanced nicotine self-administration during adulthood in male and female rats. **Methods:** Male and female Wistar rats were treated with saline or nicotine (0.4 mg/kg, sc; base) from P24 - 42. Nicotine induced locomotor sensitization was studied in the small open field test after the 1st, 2nd, and 6th nicotine injection. On P43, 24 h after the last injection, the rats were tested for anxiety-like behavior in elevated plus maze (EPM) test, and locomotor activity was assessed in the small open field test. During adulthood (>P70), locomotor activity was measured in a small open field test and anxiety-like behavior in the large open field and EPM. Finally, the rats were implanted with jugular catheters and the acquisition of intravenous nicotine (0.03 mg/kg; base) self-administration (3h/day) was measured for 10 days. **Results:** Nicotine treatment during adolescence had no effect on body weight gain in the males or females. The body weight increased over time and the males gained more body weight than females. Repeated nicotine administration increased locomotor activity to a similar degree in the males and females. The percentage of open arm entries in the EPM test was slightly decreased in nicotine treated adolescent males 24 h after the last nicotine injection. Cessation of nicotine administration did not affect locomotor activity in adolescent rats. Exposure to nicotine during adolescence did not affect the locomotor activity and anxiety-like behavior in adulthood. Furthermore, adolescent nicotine exposure did not increase nicotine intake in adulthood. However, female rats self-administered more nicotine than males. **Conclusions:** These findings indicate that cessation of nicotine exposure during adolescence may increase anxiety-like behavior in males. There is no long-term effect of adolescent nicotine exposure on the acquisition of nicotine intake in males or females.

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POD54-10

SELF-ADMINISTRATION BY RATS OF LOW DOSE NICOTINE ALONE VS. NICOTINE IN TOBACCO SMOKE EXTRACT

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Significance: Nicotine is often considered to be the sole addictive chemical driving tobacco smoking. While nicotine does have reinforcing effects, there are thousands of other compounds in tobacco, some of which might act with nicotine to establish and maintain tobacco addiction. **Methods:** This study was conducted with a model using young adult female Sprague-Dawley rats to determine if iv self-administration of low dose (3 µg/kg/infusion) nicotine is enhanced by the co-administration of the complex mixture of compounds in tobacco smoke extract (TSE). **Results:** Rats self-administering nicotine alone showed a rapid initiation on an FR1 schedule during the first week of access, which was maintained with an FR3 schedule during the second week, but showed a significant decline in self-administration with an FR5 schedule during the third week. In contrast, the rats self-administering the same dose of nicotine in a complex mixture of TSE acquired self-administration more slowly but significantly increased responding over the course of the study. Increases in responding on the non-active lever was also increased in the TSE group. Nicotine in TSE caused locomotor hyperactivity over a dose range of 0-0.3 mg/kg to a significantly greater degree than rats that received the same doses of nicotine alone. **Conclusion:** This study has relevance regarding people who use conventional tobacco burning cigarettes, who self-administer nicotine in a complex mixture, vs. people who self-administer nicotine in a much purer form with e-cigarettes. It may be that the conventional rat model of nicotine alone self-administration is a better



FEATURED POSTER SESSION 55:
FEATURED POLICY POSTERS

POD55-1

PACK CHARACTERISTICS OF TOP-SELLING CIGARILLOS IN THE UNITED STATES: DIFFERENCES BETWEEN BLUNT AND NON-BLUNT PRODUCTS

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SIGNIFICANCE: Mass-merchandise cigarillos in the United States (US) are generally used for 2 purposes: as smoked tobacco products and as “blunts” (i.e., hollowed-out cigars filled with cannabis). Prior research indicates that cigarillo packaging is an appealing product feature, particularly among young adult blunt users, but few studies have characterized ways in which the industry may use cigarillo packaging as a marketing tool. **METHODS:** The 50 cigarillo products with the highest national unit sales in 2018 were identified using Nielsen sales data; 44 were successfully purchased from local retailers in July 2019. Packaging was coded for features such as: unit count (i.e., number of cigarillos), material, descriptive text, and promotions. We coded products as blunt or non-blunt based on a combination of brand and product features identified in the research literature as being associated with blunt use. Descriptive analyses, weighted by total unit sales, documented the market share of popular pack characteristics between blunt and non-blunt products in the sample. **RESULTS:** Popular brands included Black & Mild (55%), Swisher Sweets (33%), and Garcia y Vega’s “Game” (12%). Blunt products constituted 55% of the market share. While blunts were almost exclusively sold in 2-pack, resealable foil pouches (96%), non-blunts were primarily sold as single sticks (91%). Blunts were more likely than non-blunts to display the phrases “slow burn” (70 vs. 20%) and “natural” (37 vs. 7%), feature pre-pricing language (85 vs. 66%) or promotional deals (11 vs. 0%), and display social media account information on the packaging (44 vs. 0%). Blunts were less likely to contain text about age restrictions (4 vs 81%). **CONCLUSION:** A relative lack of federal regulations on cigars compared to cigarettes has resulted in a diverse and virtually unrestricted cigarillo marketplace. Packaging features such as innovative materials, sensory descriptors, and cost-saving promotions are substantially more prevalent among cigarillos commonly used as blunts, and may particularly appeal to younger consumers. Stronger packaging-focused policies at the federal and local levels may help curb cigarillo use.

FUNDING: Federal

POD55-2

TOBACCO MARKETING EXPOSURE AND RISK FOR FUTURE TOBACCO USE AMONG YOUNG ADULT NON-TOBACCO USERS

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Purpose: Tobacco marketing exposure (TME) to advertising in retail settings and frequency of store visiting may increase risk of later tobacco use among young adults. Objective vs. subjective measures of TME may provide differing views of risk of TME on tobacco use. **Methods:** Data were collected from a study of non-tobacco using young adults (18-24) in Washington, DC, 2017-19 (n = 152). TME was measured by: (1) subjective baseline self-reported frequency of visiting stores that typically contain tobacco marketing (convenience, liquor, small markets), (2) objective real-time visits to tobacco retailers over a two week period, (3) subjective reports of seeing tobacco ads in the past two-weeks, and (4) objective amount of tobacco ads identified through comprehensive photographic store audits in stores visited by respondents over a two week period. Subjective and objective store visit frequency and advertising exposure were examined in bivariate correlations and multivariable logistic regression of past 30 day tobacco use at 6-month follow-up controlling for gender and race/ethnicity. **Results:** Measures of TME were moderately correlated ($\alpha=0.58$). Bivariate analyses showed that both subjective frequency of store visits at least weekly vs. less frequently (OR=5.7 95%CI 1.8-18.0) and objective visiting measures over a two week period (OR=2.8 95%

CI 1.1-6.9) were associated with tobacco use at 6-month follow-up. Subjective reports of seeing any ads vs. not seeing ads (OR=1.4 95% CI 0.5-3.5) and objective measures of visiting stores with at least 10 tobacco ads vs. fewer or no ads over a two week period were not associated with use (OR=1.7 95% CI 0.7-4.2). In adjusted models with all TME measures controlling for gender and race, only subjective weekly store visiting was associated with later tobacco use (aOR=6.0 95% CI 1.6-22.9). **Conclusions:** Young adult non-tobacco users remain at risk for both TME and future tobacco use. In this study, store visiting frequency especially measured subjectively was most strongly associated with later tobacco use. Policies reducing TME at the point-of-sale can reduce risk for even frequent store visitors.

FUNDING: Federal

POD55-3

ASSESSMENT OF THE TOBACCO RETAIL ENVIRONMENT BEFORE IMPLEMENTATION OF A VENDOR LICENSING POLICY IN DAKAR, SENEGAL (JUNE 2019)

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Significance: Senegal’s 2014 tobacco control (TC) law requires a vendor license to sell tobacco products, though the implementing decree has not been issued. Several other TC provisions are already in effect. **Objectives:** Determine tobacco vendor density in two administrative subdivisions of Dakar, and document the tobacco retail environment and violations of TC policies at the vendor level. **Methods:** Data collectors walked all streets of Grand Dakar and Médina and at all tobacco vendors recorded geographic coordinates, vendor type, and availability of tobacco and non-tobacco products using an electronic form. In a convenience sample, additional data were collected, including: presence of tobacco advertising or promotion (TAP), product display, pictorial health warning labels (PHWLs) on packs, and required signs prohibiting smoking and sales to minors. Using Google Maps, distances between schools and retailers were calculated. **Results:** Data collectors identified 490 tobacco vendors—173 in Grand Dakar and 317 in Médina, indicating a density of 3.4 and 3.5 vendors per 1000 people respectively. Small permanent shops were the most common vendor type (80%), followed by mobile carts (18%), other street vendors (2%), and others (<1%). All vendors sold cigarettes but no other tobacco products, and 99% sold non-tobacco products. At least one tobacco vendor was located within 200 meters of each school, in violation of the law. Among the convenience sample (n=141), TC policy violations varied: 2% had packs without Senegal’s PHWLs; 24% had TAP other than product display; 74% displayed tobacco products; and 98% lacked one or both required signs. **Conclusions:** Médina and Grand Dakar have a high density of tobacco retailers. Compliance with some TC policies is high, but many vendors violate key provisions such as the ban on product display and sales near schools. Dakar should effectively implement tobacco vendor licensing to reduce density and aid enforcement of TC laws.

FUNDING: Nonprofit grant funding entity

POD55-4

MENTHOL SMOKERS WHO IDENTIFY PHARMCOLOGICAL REASONS FOR USING MENTHOL MORE LIKELY TO QUIT AND USE CONTRABAND AFTER A MENTHOL BAN

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Significance: On January 1st, 2017, the province of Ontario, Canada banned the use of menthol-flavoured tobacco products. The aim of this study is to assess how reasons for use of menthol and perceptions of menthol cigarettes prior to the ban influenced quitting behaviour following the ban. **Methods:** In Ontario, menthol smokers (n=542) were assessed with baseline surveys in September-December 2016 and follow-up surveys in January-August 2019. Two latent class analyses were performed based on nine reasons for using menthol cigarettes and seven questions related to perceptions of menthol cigarettes. Smoking behaviour following the menthol ban was measured by having made a quit attempt since the ban, successful quitting (abstinence >6 months), contraband use and the number of quit attempts made. Poisson regression, with adjustment for demographic and smoking characteristics, was used to assess the probability



of various quitting behaviours by perception and reasons latent class membership. **Results:** For the reasons of use analysis, an "Standard Class" (70%) (largest group endorsing all options), "Pharmacological Class" (9%) (endorsed predominant options associated with pharmacology of nicotine) and "Non-Pharmacological Class" (21%) (did not endorse options associated with pharmacology) were created. After adjustment, the Pharmacological Class and Non-Pharmacological Class had higher rates of contraband use following the menthol ban than the Standard Class (RR = 3.41, 95% CI 2.39 - 4.88; RR = 2.27, 95% CI 1.59 - 3.24 respectively), and the Pharmacological Class exhibited higher number of quit attempts compared to the Standard Class (RR = 5.90, 95% CI 1.62 - 21.44). For the perceptions analysis, an "Standard Class" (81%), "Pharmacological Class" (12%) and "Cooling Class" (7%) (endorsed only cooling aspects of menthol) were identified. After adjustment, the Pharmacological Class and Cooling Class had higher rates of contraband use following the menthol ban than the Standard Class (RR = 2.08, 95% CI 1.47 - 2.94; RR = 2.02, 95% CI 1.34 - 3.05 respectively) and the Pharmacological Class had higher rates of successful quits compared to the Standard Class (RR = 1.71, 95% CI 1.06 - 2.78). **Conclusions:** The study identified three distinct classes related to reasons for use and perceptions related to menthol cigarettes. This suggests important heterogeneity among menthol users and expected reaction to menthol bans.

FUNDING: Federal

POD55-5

CHANGES IN SECONDHAND SMOKE EXPOSURE AT HOME AMONG CHILDREN: FINDINGS FROM THE GLOBAL ADULT TOBACCO SURVEY

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Significance: Secondhand smoke (SHS) exposure can cause ear infections, more frequent and severe asthma attacks, respiratory infections, among children, and sudden infant death syndrome among infants. Homes are a predominant site of SHS exposure, where children are particularly vulnerable to SHS exposure because they lack control of their environment. Global Adult Tobacco Survey (GATS) data from 20 countries found at least 500 million children worldwide were exposed to SHS at home during 2009-2013. **Methods:** We analyzed data for 12 countries with repeated rounds of GATS (2008-2018): Bangladesh, China, India, Mexico, Philippines, Romania, Russian Federation, Thailand, Turkey, Ukraine, Uruguay, and Viet Nam. All countries analyzed had two rounds of data available during this period, except for Turkey which had three rounds, where the third round was compared to the second round. We assessed SHS exposure (defined as "daily," "weekly," or "monthly") at home among children <15 years, as reported by the adult GATS respondent in the household. The proportion of children exposed to SHS at home was calculated for each round, which was applied to 2019 United Nations population projections for the corresponding survey year to estimate the number of children exposed. Relative change between rounds was calculated. Statistical significance was assessed using t-tests. **Results:** Nearly 119 million fewer children in the 12 countries analyzed were exposed to SHS at home between survey rounds (311 million and 430 million children, respectively). The proportion of children exposed to SHS at home decreased in 11 of the 12 countries ($p < 0.05$); Thailand had a significant increase in SHS exposure (2009: 35.8%, 2011: 40.9%, $p < 0.05$). The relative change in SHS exposure at home ranged from -49.5% in Ukraine (2010 and 2017) to +14.2% in Thailand (2009 and 2011). **Conclusion:** Progress was made in reducing SHS exposure at home among children in 11 countries during 2008-2018. However, over 311 million children were exposed to SHS across the 12 countries. Encouraging voluntary smoke-free home rules and providing cessation resources to adults who smoke can reduce SHS exposure among children at home.

POD55-6

A QUALITATIVE ASSESSMENT OF ADMINISTRATOR AND RESIDENT PERCEPTIONS OF HUD'S SMOKEFREE RULE IN THE D.C. HOUSING AUTHORITY - ONE YEAR POST-IMPLEMENTATION

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Background: The District of Columbia Housing Authority (DCHA) enacted the smokefree public housing rule required by the US Department of Housing and Urban Development (HUD) in July 2018. The rule prohibits lit tobacco products in all living units, common areas, administrative buildings, and outdoor areas up to 25 feet. This study assessed administrator and resident perceptions of the HUD smoke-free rule 1-year post-imple-

mentation. **Methods:** Data were collected via focus groups (n=9) and in-depth interviews with residents (n=19) and DCHA administrators (n=4) from August to October 2019. Focus groups and interviews were led by semi-structured guides based on the multi-level socioecological framework and were recorded and transcribed. Transcripts were independently coded by three researchers using grounded theory and analyzed by role and smoking status using Dedoose. Consensus meetings resolved discrepancies and determined themes. Inter-rater reliability was set at > 80%. **Results:** The majority of participants identified as Black/African American (90%). Themes for each socioecological level included: 1) *Individual*. Administrators and residents supported rule implementation due to perceived health benefits. 2) *Interpersonal*. Rule was effectively communicated by lease agreement, but violations were not enforced. Fears of eviction were reported. 3) *Organizational*. Signage was present, but more accessible cessation support was needed. 4) *Community*. Residents reported continuing to smell cigarette smoke and also noted the smell of cannabis, which is legal for consumption in DC, but not in federally subsidized housing. Smokers expressed safety concerns with smoking off-property. 5) *Public Policy*. Residents reported confusion on 25 feet element and a lack of rule enforcement. **Conclusions:** Administrators and residents perceive value in the smoke-free rule, but noted several challenges across each level of the socioecological framework to address in achieving a smoke-free housing environment.

POD55-7

"I THINK THAT THAT'S WHY THESE ATTRACT YOUNG PEOPLE MORE, BECAUSE OF THE FLAVORS AND THE COLORS": PERCEPTIONS OF CIGARETTE PACKS AMONG MEXICAN CITY YOUTH

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Background In Mexico City, cigarette packs are prominently displayed at the point-of-sale, especially at the cashier zone. With a pictorial warning label that covers only 30% of the front of the pack, tobacco companies have ample space for branding on the pack. Given their importance as a marketing platform, this study aimed to explore specific features of packs that youth perceive as appealing. **Methods** Fifteen focus groups (FGs) were conducted in Mexico City with adolescents (ages 13-17) and young adult smokers (ages 18-24). FGs were separated by gender, socioeconomic status (SES) and, in the case of adolescents, smoking status. Participants interacted with a sample of cigarette packs bought locally by the study team. FGs were video-recorded, transcribed in Spanish, translated into English, and thematically analyzed. Data were then compared and contrasted within and across FGs. **Results** All FGs discussed how cigarette packs with bold and contrasting colors are particularly appealing to youth, including themselves. Participants discussed liking seeing their favorite color on the pack. Pack colors associated cigarettes with other things, including candy and sports: "[the 49ers] have these colors, so if I'm a fan of the team I'd buy things in that team's colors [like the pack]" (male adolescent non-smoker, low-SES). Colors also communicated the addition of flavors to cigarettes, increasing pack appeal: "I think that that's why these attract young people more, because of the flavors and the colors" (male adolescent smoker, mid/high-SES). Smokers discussed how flavors and flavor capsules changed their smoking experience and how the availability of different flavors increased their curiosity: "I don't know why the capsule appeals to me, I feel I want to know what it tastes like" (female adolescent smoker, low-SES). **Conclusion** Cigarette packs with flavors and colorful designs appeal to youth, including non-smokers. Communicating flavors, especially through flavor capsules, helps keep current smokers engaged with smoking. These findings reinforce the need for stronger tobacco control policies around plain packaging and a flavor ban, to reduce pack appeal to young people. **Funding** This work was supported with funding from Bloomberg Philanthropies' Bloomberg Initiative to Reduce Tobacco Use (bloomberg.org)

FUNDING: Nonprofit grant funding entity

POD55-8

DESCRIBING A VIRTUAL CONVENIENCE STORE ENVIRONMENT USABILITY AND TOBACCO-RELATED IMPACTS

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Background: Tobacco retail outlets (TROs) are an important place for regulation, as tobacco product displays and marketing may increase urge to smoke and normalize smoking. Experiments in store environments have begun to clarify the role of marketing



on tobacco use, but manipulating physical TROs is costly. Virtual retail stores (VRSs) may present an effective alternative. **Methods:** We developed a VRS for testing three experimental conditions (varying powerwall placement) compared to a control condition which lacked product branding. We hypothesized that participants would be more likely to buy cigarettes, be willing to pay more for cigarettes and e-cigarettes and have a greater post-exposure urge to vape and smoke in the experimental conditions versus control. We measured smoking and vaping urge and behavior in subjects recruited from a student pool at a large Midwestern university. We exposed participants to one of four VRS conditions and asked them to complete a post-exposure survey including intention to purchase, willingness to pay for cigarettes and e-cigarettes, urge to vape and smoke. The feasibility of the VRS was evaluated by self-report measures. **Results:** Participants (N=134) were 67% male, mainly white (60%) or Asian (26%) with a mean age of 20 years (SD=1.97). In the past 30 days, 4% were smokers, 20% e-cigarette users. A binary logistic regression suggested experimental conditions were perceived as more realistic than the control (Coef=1.15, 95% CI=.44-1.86, p=.001). Results did not suggest significant differences in terms of post-urge to vape (OR=.78, p=0.625) or smoke (OR=0.47, p=0.251), or cigarettes purchased in the VRS (OR=0.61, p=0.555). Controlling for VR experience, participants were willing to pay more for cigarettes in the experimental conditions (Coef=.32, 95% CI=.003-.63, p=.048) but across all conditions, perceived realism negatively predicted willingness to pay (Coef=-1.22 95% CI=-2.13-.30, p=0.010). VRS spatial presence and controls worked satisfactorily. **Discussion:** Future research should explore the impact of marketing on consumer tobacco-purchasing behaviors. Results suggest the feasibility of VRSs to study these effects.

FUNDING: Academic Institution

POD55-9

COMPLIANCE OF A TOBACCO-FREE POLICY AT AN ACADEMIC HEALTH INSTITUTION WITH NRT AS A GOODWILL OFFERING

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SIGNIFICANCE: Health care systems rely on tobacco-free policy implementation and promotion as a part of their tobacco control efforts. Despite signage and strategic communications of policy, continued use of tobacco on premises remains problematic. Approaches by formal enforcement are a potential strategy to improve compliance. Ambassador programs, consisting of trained staff who approach policy violators, inform about tobacco-free policies, and request compliance, are proving effective on college campuses. Minimal published literature exists regarding use of ambassador programs on health care campuses. This study examines ambassador encounters with policy violators on an academic health care campus and assesses the efficacy of NRT as a goodwill offering to improve policy compliance. **METHODS:** Data from ambassador encounters with individual or group policy violators (n=180) was collected from June, 2018 to April, 2019. People using tobacco were asked to comply with the policy and either offered NRT (n=118) or not (n=62). Approaches were recorded as compliant, noncompliant, or mixed (some, but not all, complied). **RESULTS:** Violators were categorized as visitors (74%), patients (46%), contractors (3%) or staff (4%). Products used by violators included: cigarettes (94%), e-cigarettes (3%) or other tobacco products (2%). Violators offered NRT were more likely to comply with the institution's tobacco-free policy compared to those not offered NRT ($X^2=7.17$, $p<.03$). When NRT was offered, it was accepted 46% of the time. Of the NRT accepted, the majority requested lozenges (48%), gum (22%), or a mix of both (29%). Violators who accepted NRT were more likely to comply than those who refused ($X^2=7.95$, $p<.02$). Additionally, approaches to individuals, compared to groups, led to more compliance ($X^2=11.84$, $p=.002$). **CONCLUSION:** An ambassador approach to policy violators led to increased compliance with a tobacco-free policy. A goodwill offering of NRT achieved significantly greater compliance. This enforcement may increase perceived organizational support by patrons and future research should examine whether the goodwill offering of NRT improves perceptions of health systems.

FUNDING: Academic Institution; Nonprofit grant funding entity

POD55-10

THE IMPACT OF TOBACCO RETAIL LICENSING IN VIRGINIA: A SYSTEM DYNAMICS SIMULATION STUDY

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Background: Virginia raised the minimum legal age of sale for tobacco from 18 to 21 (T21), on July 1, 2019. Enforcement of the T21 law is essential to ensure the compliance

of retailers and to achieve the intended effects of the law. Tobacco retailer licensing (TRL) is a possible policy tool for the enforcement. **Objectives:** To simulate and predict the effects of different levels of TRL enforcement on youth cigarette use and the consequent health and economic impacts. **Methods:** A system dynamics model (SDM) was developed. The model was parameterized, calibrated and validated based on empirical data: National Youth Risk Behavior Surveillance System (YRBSS), Behavioral Risk-Factor Surveillance System (BRFSS) of Virginia, and YRBS Combined Datasets of Virginia. **Results:** On the basis of existing practices in other states, we used 4 TRL provisions: 1) retailers are required to pay an annual fee; 2) all retailers are required to obtain a license to sell tobacco and renew it annually; 3) any violation of tobacco law is considered a violation of the license; and 4) financial deterrents using fines and penalties for violations, and suspension and revocation of the license. Our SDM simulated youth smoking status with 4 enforcement levels: No licensing; Minimum TRL enforcement (provision 1 + one of the other provisions); Moderate TRL enforcement (provision 1 + two of the other provisions); Comprehensive TRL enforcement (all four provisions). The results suggested that the Virginia youth smoking prevalence would decrease by 1.09% by the end of 2031 under comprehensive TRL enforcement compared with no enforcement. Additionally, non-Hispanic White and Hispanic youth were more responsive than non-Hispanic Blacks to the enforcement—the greatest yearly reduction in smoking prevalence was estimated to be 1.81% and 1.45%, respectively, under comprehensive TRL regulation. Our back-of-envelope estimation showed that, by comprehensive TRL regulation, \$2,459 million direct life-long medical costs and 614 smoking-attributable deaths would be saved over next 10 years. **Conclusions:** TRL regulations could be an effective policy option to ensure and enhance the effects of the T21 law.

FUNDING: Nonprofit grant funding entity

**POSTER SESSION 1: PRE-CLINICAL
POSTER SESSION****PC-1****EFFECTS OF ADOLESCENT NICOTINE EXPOSURE ON
THE SPONTANEOUS ACQUISITION OF NICOTINE SELF-
ADMINISTRATION DURING ADULTHOOD IN RATS**

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Significance: Tobacco use is on the decline among US adults, but electronic-cigarettes use has increased alarmingly among young people in recent years. It is possible that adolescent nicotine use can lead to a greater risk for becoming a regular smoker and developing a nicotine addiction later in life. Therefore, we investigated if early- and mid-adolescent (postnatal day (P) 24-42) nicotine exposure enhanced nicotine self-administration during adulthood in male and female rats. **Methods:** Male and female Wistar rats were treated with saline or nicotine (0.4 mg/kg, sc; base) from P24 - 42. Nicotine induced locomotor sensitization was studied in the small open field test after the 1st, 2nd, and 6th nicotine injection. On P43, 24 h after the last injection, the rats were tested for anxiety-like behavior in elevated plus maze (EPM) test, and locomotor activity was assessed in the small open field test. During adulthood (>P70), locomotor activity was measured in a small open field test and anxiety-like behavior in the large open field and EPM. Finally, the rats were implanted with jugular catheters and the acquisition of intravenous nicotine (0.03 mg/kg; base) self-administration (3h/day) was measured for 10 days. **Results:** Nicotine treatment during adolescence had no effect on body weight gain in the males or females. The body weight increased over time and the males gained more body weight than females. Repeated nicotine administration increased locomotor activity to a similar degree in the males and females. The percentage of open arm entries in the EPM test was slightly decreased in nicotine treated adolescent males 24 h after the last nicotine injection. Cessation of nicotine administration did not affect locomotor activity in adolescent rats. Exposure to nicotine during adolescence did not affect the locomotor activity and anxiety-like behavior in adulthood. Furthermore, adolescent nicotine exposure did not increase nicotine intake in adulthood. However, female rats self-administered more nicotine than males. **Conclusions:** These findings indicate that cessation of nicotine exposure during adolescence may increase anxiety-like behavior in males. There is no long-term effect of adolescent nicotine exposure on the acquisition of nicotine intake in males or females.

FUNDING: Federal

PC-2**DEVELOPMENT OF A NICOTINE AEROSOL SELF-
ADMINISTRATION MODEL IN RATS AND THE EFFECTS OF
E-LIQUID FLAVORS**

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INTRODUCTION: There are currently no established preclinical models of aerosol nicotine self-administration (ANSA) in which nicotine functions as a reinforcer. 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. Due to the association with sweet tastes, ENDS flavors become conditioned reinforcers for human users. **METHODS:** Rats were first trained to press a lever for liquid sucrose (20% of volume) with 0.25% raspberry flavor or no flavor in a standard operant chamber. Rats were then transferred to aerosol self-administration chambers. Meeting the schedule of reinforcement on the active lever resulted in delivery of aerosolized ENDS liquid containing 3% raspberry flavor and 0, 6, or 12 mg/ml nicotine. Meeting the schedule of reinforcement on the inactive lever had no programmed consequence. The schedule of reinforcement for aerosol delivery began with a fixed ratio 1 (FR1), and was increased across days to an FR3. **RESULTS:** Rats responded similarly for raspberry flavored and unflavored sucrose. Rats also responded similarly for raspberry flavored and unflavored aerosol. This suggests that exposure to raspberry flavored sucrose did not establish raspberry aerosol as a conditioned reinforcer. Aerosol intake was similar for nicotine and vehicle groups; however, vehicle groups were more likely to meet acquisition criteria for aerosol self-administration than nicotine groups. Throughout the aerosol phase, rats responded more on the active than inactive lever, which suggests that the aerosol had some reinforcing properties. **DISCUSSION:**

Although development of a preclinical model of ANSA that demonstrates reinforcing effects of nicotine is still in progress, these results indicate that liquid sucrose training and the use of flavors may facilitate ANSA. Aerosolized flavors may enhance acquisition of responding, suggesting that policies to regulate flavors in all ENDS device types 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

PC-3**SELF-ADMINISTRATION BY RATS OF LOW DOSE NICOTINE
ALONE VS. NICOTINE IN TOBACCO SMOKE EXTRACT**

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Significance: Nicotine is often considered to be the sole addictive chemical driving tobacco smoking. While nicotine does have reinforcing effects, there are thousands of other compounds in tobacco, some of which might act with nicotine to establish and maintain tobacco addiction. **Methods:** This study was conducted with a model using young adult female Sprague-Dawley rats to determine if iv self-administration of low dose (3 µg/kg/infusion) nicotine is enhanced by the co-administration of the complex mixture of compounds in tobacco smoke extract (TSE). **Results:** Rats self-administering nicotine alone showed a rapid initiation on an FR1 schedule during the first week of access, which was maintained with an FR3 schedule during the second week, but showed a significant decline in self-administration with an FR5 schedule during the third week. In contrast, the rats self-administering the same dose of nicotine in a complex mixture of TSE acquired self-administration more slowly but significantly increased responding over the course of the study. Increases in responding on the non-active lever was also increased in the TSE group. Nicotine in TSE caused locomotor hyperactivity over a dose range of 0-0.3 mg/kg to a significantly greater degree than rats that received the same doses of nicotine alone. **Conclusion:** This study has relevance regarding people who use conventional tobacco burning cigarettes, who self-administer nicotine in a complex mixture, vs. people who self-administer nicotine in a much purer form with e-cigarettes. It may be that the conventional rat model of nicotine alone self-administration is a better model for studying e-cigarette use, whereas TSE self-administration is a closer model of smoking of tobacco in conventional cigarettes. We need to mention which one, nicotine alone or TSE containing nicotine, is more addictive.

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PC-4**NICOTINE AND ALCOHOL CO-ABUSE: DIFFERENTIAL EFFECTS
OF NICOTINE AND ALCOHOL ON NEUROIMMUNE FUNCTION**

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Significance. Nicotine and alcohol are two of the most commonly co-abused substances with as many as 85% of adults with an alcohol use disorder also using nicotine products. When these drugs are used in combination, rates of several types of cancers along with heart and lung conditions increase substantially. Furthermore, the rising popularity of vaping brings a host of new challenges in understanding co-abuse and its negative health outcomes. Recently, the neuroimmune system has emerged as an important component regulating drug intake. Previous studies have shown that alcohol intake is capable of activating the neuroimmune system via toll-like receptors (TLRs), inducing a pro-inflammatory cascade, and that activation of these same receptors promotes further alcohol intake. By contrast, there is evidence that nicotine is actually anti-inflammatory in the brain. Despite these fascinating differential findings, few studies have assessed nicotine and alcohol in combination for their effects on neuroimmune function. As such, the goal of the current experiments was to (1) determine the effects of nicotine, alcohol, and nicotine+alcohol exposure on expression of neuroimmune proteins in rat brain and (2) determine the effects of neuroimmune activation on nicotine, alcohol and nicotine+alcohol self-administration in rats. **Methods.** For both experiments, adult male and female Long-Evans rats were used. Experiment 1: Rats were exposed to non-contingent nicotine vapor, oral alcohol, or both in daily sessions for 20 days after which brains were extracted for analysis of several neuroimmune proteins. Experiment 2: Rats were trained to self-administer nicotine vapor, liquid alcohol, or have co-access for 2 months. Rats were then treated with the TLR3 agonist poly(I:C) prior to two consecutive regular self-administration sessions. **Results.** In experiment 1, rats exposed to alcohol alone showed a significant increase in expression of TLR3 protein in the nucleus accumbens core. Interestingly, this effect was entirely blocked in rats that were



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exposed to both alcohol and nicotine. In experiment 2, following activation of TLR3, rats increased self-administration of both nicotine and alcohol. **Conclusions.** Taken together, these findings suggest neuroimmune dysfunction as a possible mechanism supporting nicotine and alcohol co-abuse.

FUNDING: Academic Institution

PC-5

NICOTINE VAPOR SELF ADMINISTRATION IN MICE

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Significance: In the US, a decline in tobacco use has been observed in recent years due to increasing awareness of its harmful effects; however, this has been paralleled by an alarming increase in e-cigarette use among never-smokers. Furthermore, the abundant choices of flavor for e-cigarettes make them attractive for non-smokers to initiate the vaping habit. Therefore, the development of a vapor-self administration model is necessary to allow us to better understand how this method of nicotine exposure differentially alters brain circuitry and function. **Methods:** Mice were food restricted to 85-90% of their free-feeding body weight before food training. The mice were trained to press an active lever in an operant chamber to obtain chocolate milk in a 1-hour session. After stable responding was established for food reward, the mice were then provided access to nicotine or vehicle vapor on a fixed ratio 5, time out 20 sec schedule of reinforcement. Blood was collected to assess the level of nicotine's main metabolite, cotinine, following self-administration sessions. Finally, to validate that the mice were actively seeking nicotine during nicotine vapor self-administration, another cohort of mice were pre-treated with the nicotinic receptor antagonist, mecamylamine. **Results:** The mice established reliable food training across 7 days. When provided access to nicotine vapor, the mice actively pressed the lever to deliver vaporized nicotine. Pre-treatment with mecamylamine attenuated lever pressing behavior, demonstrating that the mice were selectively pressing the active lever for the delivery of nicotine puffs. Finally, blood cotinine levels confirmed that the mice were inhaling significant quantities of nicotine during the vapor sessions. **Conclusion:** Taken together, these studies establish a novel protocol for nicotine vapor self-administration in mice, which may be employed to further investigate the effects of e-cigarettes on behavior, lung and brain function.

FUNDING: Federal

PC-6

CHEMICAL CHARACTERISTICS OF TOBACCO-FREE NICOTINE POUCHES

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Background: The market for tobacco-free oral nicotine pouches has expanded in the U.S. in recent years. The pH of smokeless tobacco is known to affect nicotine delivery through its influence on the percent of nicotine in the free-base form. However, little is known about the pH of tobacco-free nicotine pouches. Methods: Eight brands of nicotine pouches and one brand of snus were selected for chemical analysis to determine their pH in water. The nicotine pouch brands were On! Mint (2mg, 4mg, and 8mg nicotine) produced by Helix Innovations LLC, Dryft Spearmint (4mg and 7mg) produced by Dryft Sciences, Zyn Cool Mint (6mg) produced by Swedish Match, and Velo Mint (2mg and 4mg) produced by R.J. Reynolds (RJR). Camel Snus Mint, also produced by RJR, was selected as a comparator product. Three replicates of 2g of each product were tested for pH in water using a standardized methodology required by the Food and Drug Administration (F.R. Vol. 74, No. 4). To mirror actual use conditions, the pH was also measured for single pouches placed in 20mL of artificial saliva (pH 6.8). Results: Mean pH of nicotine pouches varied by brand, with On! and Zyn having the highest pH values of 8.19 and 8.17, respectively. They were followed by Dryft (7.85) and Velo (pH 7.53). Camel Snus had the lowest pH (7.47). Within brands, the pH decreased monotonically with increasing labeled nicotine content for On! (2mg: 8.47, 4mg: 8.17, and 8mg: 7.94). The pH increased slightly with labeled nicotine for Velo (2mg: 7.33, 4mg: 7.48). For Dryft, pH was much higher for the 7mg product (8.17) than for the 4mg product (7.58). In artificial saliva, the pH of Zyn was not lower than in water (8.22) while that of On! was reduced the most (7.41). The pH for Dryft (7.57), Velo (6.89), and Camel Snus (6.89) were reduced to a lesser extent. Discussion: The pH of nicotine pouches varied by brand. Brands originating in Europe (Zyn, On!) had pH>7.9 in water that more closely mirrored those reported for Swedish snus. Velo and Camel Snus, both manufactured by RJR, had pH levels that were closer to those reported for American snus and moist snuff (pH<7.9). There were also considerable differences between brands in the effect of artificial saliva on pH, suggesting differences in buffering capacities. Within brand

variations in pH did not vary with labeled nicotine content in a consistent way. As the availability and use of oral nicotine products increases in the U.S., studies of their pharmacokinetic effects, abuse liability, potential use for smoking cessation, and long-term health impacts are needed.

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PC-7

DOSE AND EFFECT OF E-CIGARETTE VAPE IN AN AIRWAY IN VITRO MODEL

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E-cigarettes evaporate a liquid consisting of glycerol and propylene glycol, which often contains nicotine and flavourants. Many flavourants used in e-liquid have been tested for their toxicological effects for oral use, e.g. in food products, and have a GRAS status: Generally Regarded as Safe for oral use. However, inhaling such compounds could impose health risk because the exposure route is different and pyrolysis products may be formed in the e-cigarette. Identification of the most hazardous flavourants in e-liquids would allow informed decision making by users or regulation by governments. In vitro airway models were used to identify toxicological effects of one of the flavourants occurring in many e-liquid flavours: ethyl maltol. Epithelial cells form the first line of defense for inhaled compounds, many of which deposit in the bronchia. Human bronchial epithelial cells (Calu-3 cell line) were cultured at the air-liquid interface and exposed to vape from e-liquids with or without nicotine (10mg/ml) and with or without ethyl maltol (10mg/ml). Cells were exposed (2 puffs/min, 55ml/puff, 3 sec per puff) once (30 minutes) or twice (60 minutes) per day for 2 consecutive days using a Vitrocell smoking machine (VC1). Exposed concentrations, measured in the air just above the cells, was found to be approximately half of the nominal concentration (based on e-liquid usage). In addition, translocation was measured in the basolateral compartment during the post-exposure period. Other parameters, such as cell viability and epithelial membrane integrity, indicated no effect of the exposure. IL-8 production was affected in exposed cells, which was more pronounced after two exposures per day compared to a single exposure per day. Further characterization of the toxicity will include assessment of other cytokines. Our data show an effect of exposure to e-cigarette vape, but more testing is required to determine whether nicotine and ethyl maltol may have adverse effects on other parameters or after prolonged exposure. Also, we found translocation of nicotine and ethyl maltol across the cell barrier, which could be an indicator of absorption of these compounds.

FUNDING: Federal

PC-8

JUUL RELEASES NEW TECHNOLOGY PRODUCTS WITH A HIGHER EMISSIONS PROFILE

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The JUUL electronic cigarette (ECIG) emerged in 2015 and quickly became one of the top-selling ECIGs in the USA. JUUL's popularity is likely due to its use of a salt-based, high nicotine concentration liquid, compact form, and temperature-regulation technology. In 2019, JUUL Labs released new JUULpods in the market labelled 'New Technology'. JUUL Labs claim that the new technology pods use cotton rather than a silica wick, offering 'more consistency puff-to-puff' and higher delivery of 'nicotine per puff and more vapour depending on usage patterns'. In this study, we compare the electrical characteristics, liquid composition, and aerosol emissions of new and previous generation JUUL pods procured in the UK in July, 2020. We measured device geometry and electrical characteristics, including voltage versus time during a puff for new and previous generation JUUL pods. We also compared the liquid composition (PG/VG, nicotine concentration, and pH), and nicotine emissions across the two products. All study outcomes were obtained in triplicate each time using a new pod. We found that the 'new technology' JUUL pods use a different wicking material than the previous pods. We also found that compared to the previous generation, the new pods produced a higher average voltage during a puff and greater nicotine yields. We found no differences in geometry, electrical resistance, and liquid composition. Because the internal temperature-controlled JUUL power circuit delivers a consistently higher average voltage during a puff, it is likely that the new wick design provides better liquid transport to the coil than with the previous generation JUUL pods. The higher average voltage, in turn, results in higher nicotine emissions per puff. The findings of this study suggest that



even the most successful ECIG products may continue to morph in a manner that may impact abuse liability, and indicate that regular monitoring of marketed products may be necessary to understand downstream population-wide ECIG use patterns over time.

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PC-9

HEAVY METALS IN LITTLE CIGARS, CIGARILLOS AND LARGE CIGARS

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Heavy metals are toxic constituents in tobacco, and their analysis is useful to fully understand a tobacco product's health impacts. Although important, heavy metal characterization in cigars has not been widely studied. Therefore, we investigated cadmium and arsenic amounts in filler of little cigars, cigarillos and large cigars, which differ in size, shape, tobacco blends and manufacturing processes, and compared them across subcategories and with cigarettes. Metal concentrations were analyzed using "Triple Quad" ICP-MS. The mean arsenic quantities in little cigars, cigarillos and large cigars are 0.222, 0.225 and 0.201 micrograms per gram, respectively. For cadmium, the mean quantities in little cigars, cigarillos and large cigars are 1.24, 1.30 and 1.54 micrograms per gram, respectively. Little cigars and cigarillos have statistically similar arsenic and cadmium quantities on a per gram basis. Large cigars have the highest and lowest quantities of cadmium and arsenic, respectively; however, both metals in large cigars are statistically similar to little cigars and cigarillos. Furthermore, heavy metal concentrations varied with manufacturers and flavors, although only little cigars were analyzed using flavor data. A high arsenic quantity did not necessarily relate to a high cadmium quantity for a specific manufacturer or flavor and vice versa. Upon comparing these cigar results to cigarettes, cigarette mean arsenic quantity was the highest (0.287 micrograms per gram, *p* is less than 0.05) whereas, mean cadmium quantity was the lowest (1.23 micrograms per gram, *p* is greater than 0.05) of all the product categories. Different tobacco blends, growing locations and agricultural conditions are likely reasons for the observed differences in metal quantities. Overall, mean cadmium quantity is similar across cigar subcategories and cigarettes while mean arsenic quantity is similar within cigar subcategories but statistically different when compared with cigarettes. This work is funded by the Interagency Agreement, 224-10-9022, between the Food and Drug Administration and the Centers for Disease Control and Prevention. The authors have no competing financial interests.

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PC-10

TOBACCO VARIETAL AND CURING INFLUENCES ON FREE RADICAL PRODUCTION

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Often overlooked by researchers, the specific variety of tobacco used in a tobacco product can have a significant impact on the types and quantities of oxidants and toxicants released when smoked. The main varieties used in commercial cigarettes are burley, bright, oriental, and reconstituted. Commercial cigarettes utilize proprietary blends of different tobacco varieties, additives, and flavorings making analysis and comparisons between products murky. In addition, the curing method (air, sun, flue, or fire cured) of each variety can also impact the characteristics of the final product. In an effort to eliminate some of this variability and look at the impact of individual tobacco varieties on toxicant production, different varieties of organic and non-organic whole leaf burley, bright, or oriental tobacco were purchased, shredded, and machine packed into single blend, additive- and flavor-free cigarettes. Each single blend cigarette was analyzed for gas-phase and particulate-phase free radicals using electron paramagnetic resonance (EPR). Nicotine and nicotine-derived nitrosamine ketone (NNK), a known carcinogen, were extracted from Cambridge filter pads and analyzed. Despite being humidified and packed using the same conditions, the burning and smoldering rates of cigarettes varied widely between varieties. In general, burley tobacco smoked the fastest followed by oriental and bright varieties. On a per gram of smoked tobacco basis, burley tobacco produced more gas-phase free radicals followed by oriental and bright tobacco. Particulate-phase radicals did not show a significant trend when looked at on a per gram tobacco basis. Nicotine content on a per gram tobacco smoked basis was highest in burley followed by oriental and bright. Gas-phase radicals and nicotine varied over 5-fold and 11-fold, respectively, between tobacco varieties. While most

cigarettes are comprised of a blend of different varieties, it appears those with greater ratios of burley tobacco may pose the greatest risk to smokers due to the high levels of oxidants produced.

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PC-11

NICOTINE, FREE NICOTINE, AMMONIA, AND PH ACROSS CIGAR SUBCATEGORIES

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Cigars are among the broad variety of combusted tobacco products. They typically have various sizes, shapes, tobacco blends and manufacturing processes. Although terminology varies, cigars may be subcategorized or labelled as little cigars, cigarillos, or large cigars (may include regular and handmade "premium" cigars). Understanding the chemistry across cigar types may provide a scientific basis for categorizing cigar products in regulatory decisions. Filler from 50 cigars (7 little cigars, 19 large cigars, 16 cigarillos, and 8 pipe tobacco cigars) were analyzed using validated in-house methods for nicotine, ammonia, and pH. The mean nicotine content is higher for pipe tobacco cigars (14.5 mg/g) and large cigars (13.2 mg/g) than for little cigars (11.6 mg/g) and cigarillos (11.5 mg/g). The mean ammonia content and mean pH concomitantly increase across the product subcategories of pipe tobacco cigars (1.4 mg/g; 5.2), little cigars (2.2 mg/g; 6.3), cigarillos (3.1 mg/g; 6.3), and large cigars (3.5 mg/g; 6.7). Although the mean nicotine content of pipe tobacco cigars and large cigars are comparably high, due to their relatively lower ammonia content and pH, pipe tobacco cigars have the lowest calculated mean free nicotine content (0.02 mg/g) of the subcategories tested. The mean free nicotine content increases across the other product subcategories of little cigars (0.22 mg/g), cigarillos (0.28 mg/g), and large cigars (0.75 mg/g), which corresponds to increases in mean ammonia content and mean pH. These findings suggest that ammonia may affect pH levels and free nicotine content across cigar subcategories. This work was funded by the Interagency Agreement, ID number 224-10-9022, between the Food and Drug Administration and the Centers for Disease Control and Prevention. The authors have no competing financial interests.

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PC-12

TRANSLATION OF BEHAVIOR CHAINS TO UNDERSTAND HABIT LEARNING

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Significance Behavior occurs in sequences or "chains" of responses that lead to a reinforcing outcome. For example, someone that smokes cigarettes while driving in their car must also procure cigarettes from a store. These are different behaviors that are triggered by distinct cues. Effective behavior change will require addressing each link of the chain. Rat studies suggest that chained behaviors form direct and specific associations. Here we report recent studies that with a new method to study chained behaviors in human participants. **Methods** Undergraduate participants (23 female, 4 male; 18-26 years old) completed a computer task that involved learning to press a keyboard button (R) when a shape on the screen changed color in order to earn points. A within-subject design arranged three R1-R2 chains (R1-R2, R3-R4, and R5-R6) across six keyboard buttons. On a chain trial, an R1 shape turned blue and presses on the correct button turned the shape back to yellow and turned a second, specific R2 shape blue. When an R2 shape was blue, pressing on a specific R2 button earned a point. After learning the three chains, all participants received a reevaluation treatment consisting of intermixed trials of R2 extinction and R6 reinforcement. Reevaluation was followed by a test that consisted of intermixed R1, R3, and R5 trials. A second, preregistered, experiment recruited two groups of 30 participants from the same subject pool to complete the same task. Group Brief received identical training to the participants in the first experiment, and Group Extended received 4 times the amount of chain training. **Results** Participants successfully learned the chain task. For the first experiment, test results indicate lower responding on R1 associated with the extinguished R2, compared to R5 associated with the reinforced R6. The results of the second experiment replicate those of the first and show the reevaluation effect on R1 remained strong after extended training. **Conclusions** The results are consistent with rat studies suggesting that behavior chains involve learning specific associations between responses, and that



R2 can function as a "goal" for R1. This research has potential to address difficulties in the experimental study of habit learning with humans, and provide a more complete understanding of the associative basis of addicted behavior.

FUNDING: Federal

PC-13

EFFECT OF UNANI FORMULATION HABB-E-JAWAHAR ON MECAMYLAMINE PRECIPITATED NICOTINE WITHDRAWAL IN RATS

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Background The Unani compound formulation drug, Habb-e-Jawahar (HJ) is one of the most important drugs used in the indigenous system of Unani medicine in India. It is considered to be one of the potent drug of nervous system and provide strengthening to the vital organs. The present study aims to evaluate the efficacy of Unani compound drug Habb-e-Jawahar for its ability to attenuate mecamlamine precipitated nicotine withdrawal in nicotine dependent rats. **Methods** Male adult Wistar albino rats (175-250gms) were made physically dependent by subcutaneous infusion of nicotine (9.0mg/kg/day) via a 7-day osmotic pump, whereas control rats received saline via osmotic pumps. Test doses of Unani Formulation Habb-e-Jawahar (15.9, 22.5, 38.4 mg/kg) were given orally daily for 7 days. On 7th day of infusion of pumps, nicotine withdrawal, were precipitated with subcutaneous injection of nicotine antagonist mecamlamine (1 mg/kg), 2 hours after the test dose. Somatic signs of withdrawal were scored for 15 mins by using the global Gellert-Holtzman (GH) rating scale followed by a measurement of motor activity. **Results** Oral administration of Unani compound formulation Habb-e-Jawahar at all test doses (15.9, 22.5 and 38.4 mg/kg) showed significant decrease in motor activity and significant reduction in mecamlamine (1mg/kg) precipitated withdrawal signs in nicotine dependent rats. **Conclusion** These results suggest that Unani formulation Habb-e-Jawahar may prove to be potential therapeutic agent to alleviate the symptoms nicotine abstinence and can be used as a complementary therapy for smoking cessation (Supported by, Ministry of AYUSH, Govt. of India, New Delhi)

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PC-14

SMOKER NEED BASED NRT PRODUCT ENHANCEMENT, INCORPORATING TAILORED QUIT SUPPORT TO THE EXISTING OROMUCOSAL NICOTINE SPRAY

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Background: Barriers to smoking cessation are multiple and varied with quit tools potentially limited by addressing a finite number of them. We investigated nicotine users perceived barriers to quitting in a large cohort of subjects in multiple geographies and cultures, to help determine optimal cessation tool requirements. Results of this data capture from smokers are presented, and the relevant nicotine replacement (NRT) product innovation discussed. The intended real-world evidence gathering of insights to validate the innovation is outlined. **Methods:** A cohort of 10,571 users of nicotine (regular users of smoked tobacco including quitters of <12mths, heated tobacco, e-cigarettes or combinations) representative of nicotine users in 7 countries were recruited to provide a proportionally representative market population for evaluation of opinion. Quit tool functional, emotional and support needs were assessed to reflect the practical, psychological and external factors that these nicotine users considered important in cessation attempts. **Results:** Smokers identified an average of 4.8 functional, 3.3 emotional and 3.0 support needs that were desirable in a cessation tool. Top functional needs were serious craving relief, good value, ease of use, and fast acting/ long-lasting effect. Emotional needs identified were those of being relaxed, in control, contented and confident, whilst support needs were those of monitoring progress, information to support self-drive and access to a supportive community. **Conclusions:** Conventional cessation tools tend to address functional and emotional needs, but to address the identified support needs an app was developed to leverage behavioural change techniques, support chosen quit route, and reflect ongoing information on progress. Use of the NRT was captured using an interactive enhancement of an existing oromucosal nicotine spray product. Real-world

evidence will be collected through app download information, appropriately anonymized app data capture and commercial data on product purchase patterns in relation to other NRT products. Early information should be available in our poster presentation.

FUNDING: Pharmaceutical Industry

PC-15

EFFECTS OF HUMECTANTS AND FLAVOR ON MICROBIAL GROWTH IN WATERPIPE TOBACCO

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Significance: Policy makers need to understand how regulatory product standards for tobacco content such as flavors and humectant additives could result in unintended health consequences. Our study evaluates the effect of these additives on microbial growth in waterpipe tobacco (WPT). **Methods:** Individual and cumulative effects of additives on microbial growth in WPT were determined by preparing a popular unflavored WPT (Moassel Salloum [MS], The Eastern Company) with and without specified amounts of humectants (propylene glycol and glycerol) and flavor (vanillin). In addition, a popular flavored WPT (Nakhla Double Apple [NDA]) was evaluated for comparison. We characterized microbiota in WPT by combining metagenomic sequencing and shotgun proteomics. Microbial DNA and proteins were extracted from the tobacco samples (n=4/brand) and subjected to sequencing and shotgun proteomics after 1 and 7 months of incubation at room temperature (20°C). **Results:** Preliminary findings indicate that relative abundance of bacteria may change based on WPT ingredients. Differences in microbial community compositions and presence of active opportunistic and pathogenic species were observed between the unflavored and flavored WPT. The relative ratio of plant to microbial DNA were significantly different between the two tobacco brands (p=0.0015) with MS having 20.3±16.5% plant and 78.8±16.5% microbial DNA and NDA 78.3±13.3% plant and 19.5±13.5% microbial DNA. Although MS had more microbial DNA, NDA had greater microbial diversity and pathogens. High (up to 1 mg/μL) protein content allowed us to run shotgun proteomics and showed on average of 4,600-4,900 unique peptides and 120-150 proteins. The composition of proteins provides a direct evidence on activity of detected microbes. NDA showed higher percentage of proteins involved in metabolic processes, biological regulation, carbohydrate utilization and cell signaling in comparison to MS indicating a more active microbial community. **Conclusion:** Data suggests that WPT ingredients (humectants and flavor) may act as bactericides but introduce more bacterial diversity. Moreover, we confirmed the presence of active pathogenic species in WPT. **Funding and Disclaimer:** This research was supported by the National Cancer Institute of the National Institutes of Health (NIH) and the Food and Drug Administration (FDA) Center for Tobacco Products under Award Number R21CA244305. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA.

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PC-16

REVEALING THE INSIDE OF NICOTINE CHEWING GUM BY RAMAN IMAGING AND CT SCANNING

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Significance The shelf life of nicotine chewing gums is challenged by compromised chemical stability. However, the exact degradation mechanism is still unknown. Raman spectroscopy has been applied extensively to various pharmaceutical dosage forms. Raman imaging i.e. combining Raman spectroscopy and optical microscopy, is also widely used in the pharmaceutical field for a range of applications including spatial distribution of API and excipients in multi-phase formulations, but is novel to medicated chewing gum. The aim was to investigate if Raman imaging is a suitable method for determining nicotine and excipient distribution in a gum formulation. Additionally, CT (computed tomography) of gum has been performed for supplementary information on internal structure. Analysis methods on product homogeneity and excipient mobility can be valuable for understanding stability and degradation in a chewing gum formulation. This can further provide the basis for new formulation strategies leading to superior product stability. **Methods** Raman spectroscopy was carried out using an InVia Qontor confocal Raman microscope, 50x objective, 785 nanometer HPNIR laser, and a spatial resolution of 2.8 micrometer. Mapping was performed using DCLS (direct classical least squares) component analysis. CT data was acquired using a Siemens Inveon CT. Scans were performed with full rotation and exposures of 80 kilovolt and 500 microampere. The effective pixel size is 18.4 micrometer. **Results** The Raman analysis shows inho-



mogeneity of the gum, where the majority of the surface areas corresponds to the gum base, whereas nicotine and excipients are placed in separate domains. Porosity of the gums was calculated from the CT analysis. Increased air volume trapped in the gum was found for a sample that failed its stability specification, as compared to samples that complied with the stability specification. **Conclusion** Raman imaging and CT scanning of nicotine chewing gum has shown to be useful analytical techniques for understanding internal chewing gum structure and spatial distribution of nicotine and gum excipients as well as porosity. These methods are expected to be further applicable for investigating small molecule mobility during stability testing. This work is funded by Innovation Fund Denmark (grant number 7038-00043B).

FUNDING: Federal; Pharmaceutical Industry; Academic Institution

PC-17

ELECTRICAL FEATURES, LIQUID COMPOSITION AND TOXICANT EMISSIONS FROM DISPOSABLE ELECTRONIC CIGARETTES

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Introduction: Following the United States ban on flavored "pod-based" electronic cigarettes (ECIGs) in February 2020, disposable ECIG product popularity has risen, particularly among youth and young adults. Compared to pod-based ECIGs, disposable ECIGs are non-refillable, are more affordable, come in vibrant colors, and are available in appealing flavors that are prohibited in pod-based ECIGs. Little is known about the liquid and electrical characteristics of disposable ECIGs as well as how much nicotine they can emit. We analyzed the electrical and chemical characteristics and nicotine emission profiles of disposable ECIGs and compared these data to a pod-based ECIG device (i.e., a JUUL). **Methods:** Five disposable ECIGs and one JUUL (Classic Tobacco, 5% nicotine) were procured from the U.S. in 2020: Ezzy Oval (Berry Cool and Mango Lychee flavors), Hyde (Cherry Lemonade), SEA (Mint), and PuffBar (Banana Ice). Device wattage was calculated from voltage and resistance measured using a multimeter. Propylene glycol and vegetable glycerin liquid content were measured using gas chromatography-flame ionization detector, nicotine was measured using gas chromatography mass spectrometry, and liquid pH was measured using a pH-meter. Nicotine yield was measured by capturing aerosol generated by drawing 15 4 sec-puffs at 1 L/min flow rate using a puffing machine. **Results:** After 15 puffs, nicotine yield ranged between 1.6-6.7mg and liquid consumed ranged from 59-150mg compared to 1.7mg of nicotine and 36.8mg of liquid for JUUL. Disposable ECIG power ranged between 5-9W. Disposable ECIG liquid nicotine concentration ranged between 53-85mg/mL, with 97(1)% of the nicotine in the protonated form whereas JUUL nicotine concentration was 70mg/mL (94% protonated). Propylene glycol to vegetable glycerin ratios ranged between 20/80-50/50. **Conclusions:** Some disposable ECIGs contain high concentrations of protonated nicotine, and are capable of a nicotine flux of more than 110 micrograms/sec, similar to that of a combustible cigarette. Based on their nicotine emission rates, disposable ECIGs are capable of initiating and sustaining addiction among the youth that they apparently target.

FUNDING: Federal

PC-18

IMPACT OF PROLONGED STORAGE ON THE LEVELS OF ALKALOIDS AND TOBACCO-SPECIFIC N-NITROSAMINES IN E-CIGARETTE LIQUIDS

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Background: Studies assessing exposures and effects associated with electronic cigarettes (e-cigarettes) often include switching participants to specific e-cigarette products for prolonged periods of time. Purchasing large batches of e-cigarette liquids may help to assure that such studies are not disrupted by the potential discontinuation of specific brands or flavors. We aimed to assess whether prolonged storage of e-cigarette liquids can lead to decomposition of nicotine and other alkaloids and/or the artefactual formation of tobacco-specific N-nitrosamines (TSNA). **Methods:** E-cigarette liquids Evo, Halo, and American E-Liquid were purchased as part of an on-going human trial in June/July 2018 and November 2018. A total of 42 unique varieties of liquids (various flavors and nicotine levels) were analyzed upon their delivery to our laboratory, and after 6 and 12 month of storage in their original bottles at room temperature in dark cabinets. Analyses

of nicotine, nor nicotine, anatabine and anabasine, and TSNA were performed by LC-MS/MS. **Results:** Levels of nicotine measured at baseline were consistent with the labels (within the analytical error range). After 6 and 12 months of storage, nicotine content averaged 99.6(±13.0)% and 98.1(±8.3)%, respectively, of the initial measurements. Minor alkaloids generally correlated with nicotine content at baseline and decreased by approximately 30% after 12 months of storage. NNN, NAT, and NAB were found in the majority of liquids and were generally higher in varieties with higher nicotine content. There was no consistent pattern in TSNA changes over the storage duration. **Conclusions:** Our results suggest that, under certain storage conditions, nicotine levels in e-cigarette liquids may be stable for at least 12 months following their purchase. Other tobacco-specific constituents are commonly found in e-cigarette liquids, with significant variations observed across brands/flavors and a general trend towards higher levels in liquids with higher nicotine content. Researchers need to be aware of such variations if biomarkers of these non-nicotine constituents are used to assess abstinence from smoking in switching studies.

FUNDING: Federal

PC-19

TOXICOLOGICAL ASSESSMENT OF FLAVORED E-LIQUIDS IN SPRAGUE DAWLEY RATS IN AN OECD SUBCHRONIC INHALATION STUDY COMPLEMENTED BY SYSTEMS TOXICOLOGY ENDPOINTS

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Many flavor ingredients used in inhalable e-vapor products are "generally recognized as safe" for oral consumption but have insufficient safety data when inhaled. The toxicity of inhaled flavors used in e-liquids was characterized in a 90-day study that followed OECD Test Guideline 413. Because it is time consuming to assess the safety of all of these compounds separately, flavor group representatives (FGR) selected by grouping 178 flavors into 26 distinct groups on the basis of chemical structure were tested. Flavor groups were created by using a scoring approach. Substances predicted to be of potential toxicological concern were then included from each group to create representative hypothetical mixtures for probable worst-case scenarios. Sprague Dawley rats were exposed for 6 h/day, 5 days/week, for at least 13 weeks to aerosols of a vehicle, an e-liquid (propylene glycol [PG], vegetable glycerin [VG], and nicotine), an e-liquid with three concentrations of FGR mixture, or PG/VG with a medium concentration of FGR mixture. The test atmosphere concentrations of nicotine, PG and VG were 23, 1520 and 1890 µg/L, respectively. The concentrations of the selected flavors were derived from the maximum levels used in Philip Morris Products S.A. e-cigarette product (IQOS MESH). The results indicated that inhalation of the flavored e-liquids caused minimal local and systemic toxic effects. None of the groups showed significant changes in lung inflammation. The effects of exposure to the FGR mixture were limited and nicotine-mediated, including changes in hematological and blood chemistry parameters and organ weights. There were minimal histopathological findings. Macro- and microscopic findings in the spleen, adrenal and thymus were attributed to procedure-related stress. Network perturbation analyses of gene expression data revealed that the FGR mixture added to the e-liquid did not induce a measurable response at the nose, lung or liver transcriptome level, except a nicotine-mediated effect on metabolic processes. These results showed mainly nicotine exposure-associated effects and limited synergistic effects attributable to the flavors.

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

PC-20

COMPREHENSIVE CHEMICAL CHARACTERIZATION OF THE AEROSOL GENERATED BY A HEATED TOBACCO PRODUCT

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It has been demonstrated that, in principle, heated tobacco product (HTP) aerosols contain significantly lower levels of harmful and potentially harmful constituents (HPHC) than cigarette smoke. Upon applying targeted analysis for the most extensive list of known HPHCs issued by the US FDA (containing more than 93 chemicals) to the aerosol of the Tobacco Heating System 2.2 (THS), an HTP developed by Philip Morris Products S.A., the average reduction in HPHC levels was found to be greater than 90% compared with



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the smoke from a 3R4F reference cigarette, on a per-stick basis. However, the formation of other toxicologically relevant compounds specific to HTPs could not be excluded by these targeted analyses. Therefore, advanced untargeted screening methods were applied to comprehensively characterize the composition of THS aerosol and identify compounds that may be present in THS aerosol in higher concentrations than in 3R4F smoke. Upon applying a reporting threshold (100 ng/item), which optimized the proportion of substances that could be identified by using reasonable efforts, untargeted screening demonstrated that THS aerosol was significantly less complex than 3R4F smoke, with a ca. 10-fold reduction in the total number of constituents present (532 versus ca. 4800) and no compounds unique to THS aerosol being observed at that concentration level. Untargeted differential screening, which did not apply a reporting threshold, revealed that ca. 85 compounds (for the 3 heated tobacco variants tested) were more abundant in THS aerosol than in 3R4F smoke, 9 of which were unique to THS aerosol. The observed differences between THS aerosol and 3R4F smoke are likely due to the added flavors (3R4F is an unflavored reference cigarette) and tobacco blend differences. The FDA's overall assessment regarding the yield of HPHCs analyzed by targeted analysis, and the chemicals identified by untargeted differential screening that were not in the FDA's established list of HPHCs, concluded that "the yields of potential carcinogens, respiratory toxicants, and reproductive/developmental toxicants were considerably lower in Heatstick aerosols compared with combusted cigarette smoke"¹. ¹ US FDA, MRTP Technical Project Lead. July 7, 2020. <https://www.fda.gov/media/139796/download>

FUNDING: Tobacco Industry

ing that which is *in utero*- are known to increase the risk of coronary thrombosis. While recently a new risk has been identified and termed third hand smoke (THS)-which is the residual tobacco smoke contaminant that remains after a cigarette is extinguished- it remains to be determined whether *in utero/prenatal* exposure to THS can also enhance the risk of thrombogenesis, much like FHS and SHS. Therefore, the present studies investigated the impact of *in utero* THS exposure in the context of platelet biology and related disease states. It was found that THS-exposed mice exhibited an enhanced platelet aggregation, and secretion responses. *In utero* THS was also found to enhance GPIIb/IIIa activation and phosphatidylserine exposure. Furthermore, and as for its *in vivo* impact, it was found that *in utero* THS exposure shortens the tail bleeding time, as well as the occlusion time in a model of thrombosis. Cytokine analysis revealed serum IL-9 downregulation and lung IL-5 upregulation in the THS exposed mice, which indicates impaired tissue repair and increased asthma risk, respectively. Thus, our data demonstrate for the first time that *in utero* THS exposure increases the risk of thrombosis-based disease states, which is attributed, at least in part, to their hyperactive platelets. Thus, the negative health consequences of THS should not be underestimated, and warrant further investigation. These findings should guide policy development for regulating exposure to this form of tobacco.

FUNDING: Federal; Academic Institution

PC-21

DEVELOPMENT OF A 3D INTESTINAL MODEL FOR ASSESSING IMMUNOMODULATORY PROPERTIES OF ANTI-INFLAMMATORY COMPOUNDS

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The best way to avoid harm from smoking is to never start and for those who smoke to quit, as smoking is causally linked to serious diseases including cancer and cardiovascular and pulmonary diseases. The link between smoking and ulcerative colitis (UC) is however less understood. Epidemiological and clinical evidence point to an inverse association between smoking and development of UC. Several studies have proposed the activation of nicotinic receptor (nAChR)-mediated cholinergic anti-inflammatory pathways by nicotine. During smoking, nicotine and other alkaloids are inhaled together with a large number of harmful constituents generated when tobacco burns. It is, therefore, important to decouple the harmful constituents to understand the immunomodulating properties of inhaled nicotine and other alkaloids in the context of intestinal inflammation. As nicotine and other alkaloids can now be delivered by alternative products that heat rather than burn tobacco, this work focuses on the development of a suitable model for screening anti-inflammatory compounds. We developed a 3D *in vitro* intestinal model, consisting of a differentiated epithelial layer (Caco2/HT29-MTX) and immune competent cells (differentiated THP-1), which mimics a healthy intestine and has stable barrier integrity. A controlled and reversible inflammatory state was triggered by lipopolysaccharide administration, resulting in impairment of barrier integrity and release of pro-inflammatory cytokines. The inflammatory state of this system was reversed by anti-inflammatory compounds, which proved the suitability of this model for determining the anti-inflammatory properties of selected compounds. The model was evaluated with nicotine and selected tobacco alkaloids. Although nicotine did not present anti-inflammatory effects, another alkaloid showed significant dose-dependent anti-inflammatory properties when tested on the inflamed triculture. These findings contribute to our understanding on how some tobacco alkaloids might contribute to the inverse relation observed between smoking and UC.

FUNDING: Unfunded; E-cigarette/Alternative nicotine products Industry; Tobacco Industry

PC-22

IN UTERO EXPOSURE TO THIRDHAND SMOKE MODULATES PLATELET FUNCTION AND INCREASES THE RISK OF THROMBOGENESIS

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Cigarette smoking is a major risk factor for acute coronary thrombosis. In fact, both active/first hand smoke (FHS) and passive/second hand smoke (SHS) exposure-includ-



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C-1

EXPLORATORY EVALUATION OF ONLINE BRIEF EDUCATION FOR JUUL POD-MOD USE AND PREVENTION

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Significance: Initiation of pod-mod e-cigarette use by young adults is one of the most significant public health issues within the debate on vaping. The current study examined the effect of brief educational information among young adults and investigated outcomes as a function of JUUL use and smoking status. **Methods:** Participants ($N=947$) were young adults (<30 years old) recruited from Amazon's Mechanical Turk based on smoking and JUUL use status. Participants completed baseline assessments, viewed a brief JUUL educational handout, and completed post-assessments. **Results:** There was a significant Time X Group interaction for JUUL-related knowledge ($p < .001$), with never JUUL/never smokers showing the greatest increase in knowledge. Brief education increased JUUL-related knowledge, risk perceptions, commitment to quitting, and readiness to quit JUUL (all $p \leq .001$; time x group $p > .05$ for all contrasts except JUUL-related knowledge). Participants showed decreased interest in future JUUL use, interest in purchasing JUUL, and interest in future regular use (all $p \leq .001$; time x group $p > .05$ for all contrasts). In terms of smoking outcomes, participants reported reduced perceived harm to others ($p < .001$) and decreased intentions to smoke regularly ($p = .001$). **Conclusions:** Brief education was effective in increasing knowledge and risk perceptions while reducing intentions for future use. The information was most effective in increasing knowledge among non-users, suggesting that brief education may be useful for preventing pod-mod initiation. Analysis of group differences suggest current JUUL use status is more important in informing JUUL-related attitudes than smoking status.

FUNDING: Federal; Academic Institution

C-2

UTILIZING AUGMENTED REALITY CUES TO ELICIT CRAVINGS TO SMOKE

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Smoking-related cues reliably provoke cravings to smoke and can be extinguished in the laboratory. However, extinction tends not to generalize to smokers' natural environment, limiting the efficacy of cue-exposure therapy for smoking cessation. Augmented reality (AR) via smartphone provides an opportunity to overcome this limitation. AR inserts 360-degree digital cues into a smoker's real-world, introducing the possibility of conducting extinction trials in the natural environment. The first step toward using AR smoking cues for extinction-based therapy is to verify that smoking-related cues generated by AR are realistic enough to elicit cue reactivity (CR). Therefore, we created 6 smoking-related AR cues (e.g., cigarette in ashtray) and 6 neutral AR cues (e.g., office supplies), and we compared reactivity to these cues versus similar in vivo cues using a 2 (smoking vs neutral) X 2 (AR vs neutral) within-subjects design. On 10-point Likert scales, participants ($N=17$; 71% female; mean age=50.41) rated their craving to smoke in response to all 6 cues, which were repeated semi-randomly 4 times for a total of 24 cues, as well as the perceived reality and user and environmental co-existence of the AR cues. CR was assessed by comparing urge ratings in response to smoking-related cues versus neutral cues. Smoking-related AR cues were generally perceived as being realistic ($M=7.16$, $SD=2.23$) and well-integrated into both the environment ($M=7.12$, $SD=2.24$) and the user's experience ($M=7.04$, $SD=2.22$). As hypothesized, we found large CR effects for AR cues ($Z=3.44$; $P=.001$; $d=1.37$). CR to in vivo cues was also found ($Z=3.41$ $P=.001$; $d=1.64$) at a slightly higher magnitude than AR reactivity ($Z=2.67$, $P=.008$; $d=.36$). This study demonstrated that digitally-created smoking stimuli, as viewed through a smoker's smartphone via AR technology, were perceived as realistic and that they elicited cravings at magnitudes approaching those of actual in vivo smoking stimuli. These findings support the potential of AR both for CR research conducted in smokers' natural environments and for their use in extinction-based cue-exposure therapies conducted in that same environment.

FUNDING: Federal; Academic Institution

C-4

COMPARING PROSPECTIVE PREDICTION OF CESSATION OUTCOMES FROM FOUR COMMON MEASURES OF DEPENDENCE IN A LARGE CLINICAL TRIAL OF YOUNG, TREATMENT-SEEKING E-CIGARETTE USERS

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Background. Multiple self-report measures for nicotine dependence in e-cigarette users exist. Scales include the 4-item PROMIS-e and the 10-item HONC. "Daily-Vaping" and an adapted "time to first" (TTF) item for vaping have been used as proxies for dependence. We compared the association of these measures with abstinence and their utility in classifying vaping outcomes among e-cigarette users enrolled in a cessation trial. **Method.** Young adult vapers interested in quitting (aged 18-24; $N=2,588$) were recruited by web ad. HONC, PROMIS-e, TTF, and Daily-Vaping were assessed at baseline. Item Response Theory with HONC and PROMIS-e generated two liability scores for each user. TTF was analyzed as a 4-level variable. Dichotomous self-reported outcomes at 1-month included 7-day abstinence and reduction in vaping days/week among continuing users. **Results.** Response rate was 79% ($n=2057$). Half the sample (49%) vaped ≤ 5 minutes of waking; 93% vaped daily. At 1-month, 34% were abstinent and 55% had reduced vaping. Liability scores from HONC were continuously and symmetrically distributed, with some evidence of ceiling effects. Liability scores from PROMIS-e were semi-continuous, with 37% of participants receiving the highest possible score (compared to 6% from HONC). Versions of HONC, PROMIS-e, and TTF standardized by their inter-quartile range (IQR) performed similarly across outcomes. All three were bivariate associated with abstinence (ORs 0.75 to 0.83) and consumption (ORs 0.64 to 0.73); classification accuracy was above chance for both abstinence (AUC 0.54 to 0.56) and reduction (AUC 0.57 to 0.59). Daily-Vaping was associated with abstinence (OR=0.42) but not with reduction (OR=1.04); it was not useful for predicting abstinence (AUC=0.47) or reduction (AUC=0.50). **Conclusions.** HONC, PROMIS-e, and TTF are roughly equivalent in their prospective associations with and classification of vaping abstinence and reduction. Although Daily-Vaping was associated with abstinence, it showed poor discrimination. Additional findings suggest that dichotomous measures of nicotine dependence may be more useful for studies of association, such as population surveillance, than for prediction purposes, such as clinical decision-making for individual treatment. Identifying contexts where researchers should prioritize association versus classification is discussed.

FUNDING: Nonprofit grant funding entity

C-5

AN 18-MONTH SMOKING CESSATION INTERVENTION INCORPORATING PHARMACOTHERAPY AND BEHAVIORAL COUNSELING DELIVERED IN COMMUNITY MENTAL HEALTH SETTINGS IMPROVES TOBACCO ABSTINENCE RATES IN ADULTS WITH SERIOUS MENTAL ILLNESS: RESULTS OF A RANDOMIZED CLINICAL TRIAL

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Significance: Tobacco smoking is the largest contributor to cardiovascular mortality disparity among those with serious mental illness (SMI). Combined pharmacologic and behavioral treatments improve tobacco abstinence rates, but the most effective evidence-based treatments are under-utilized for those with SMI, and cessation efforts tend to target the minority of smokers ready to quit right away despite recommendations to offer treatment to all smokers. Weight gain often accompanies abstinence. **Methods:** To test the effectiveness of an 18-month smoking cessation intervention, 192 adult daily tobacco smokers with SMI were enrolled and randomized, stratified by readiness to quit in 1 month or 1-6 months, to be offered 18 months of community delivered 1st-line cessation pharmacotherapy, smoking cessation counseling tailored to readiness to quit, weight management counseling and support for physical activity or a quit line referral. **Results:** Participants were mean(SD) 49.6(11.7) years old, smoked 12.1(9.5) cigarettes/day; BMI 32.0(7.6) kg/m²; 51% female, 48% African-American, 62% willing to quit in 1 month. At 18-months, 95% of participants provided data, 27.8% of those assigned to the intervention and 6.3% of controls achieved biochemically verified 7-day point prevalence smoking abstinence ($p<0.0001$); adjusted odds ratio 6.0 (95% CI: 2.3 -15.6; $p=0.0002$).



There was no significant modification of intervention effect on abstinence by readiness to quit. Mean difference in weight change over 18m between active and control was not significant (3.5 lbs, 95% CI: -3.3 -10.3; $p=0.32$). **Conclusion:** Offering 18 months of evidence-based smoking cessation treatment to adult smokers in a community mental health setting substantially increased tobacco abstinence rates without significant weight gain. Offering guideline concordant best practice smoking cessation treatment to all smokers with SMI, regardless of readiness to quit right away or in 6 months is likely to improve CVD health in this high-risk population.

FUNDING: Federal

C-6

CHANGES IN DEPENDENCE, WITHDRAWAL, AND CRAVING AMONG ADULT SMOKERS WHO SWITCH TO NICOTINE SALT POD-BASED E-CIGARETTES

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Significance: Complete switching from combustible to electronic cigarettes (ECs) reduces harm to the user. For ECs to be a viable substitute, they need to be rewarding enough for regular use, indicated by factors such as craving and dependence (i.e., reinforcement profile). However, little is known about short-term changes in reinforcement value across trajectories of EC use. We assessed these factors during a 6-week switching trial. **Methods:** Participants were randomized 2:1 to switch to a nicotine salt pod system EC or continue smoking (assessment-only control) in a 6-week trial. 114 African American ($n=60$) and Latinx ($n=54$) smokers were randomized to receive ECs and are included in the current investigation. At week 6, participants were classified by use trajectory: exclusive smokers ($n=16$), exclusive EC users ($n=32$), or dual users ($n=66$). Participants reported on their EC, cigarette, and total nicotine dependence (cigarette + EC dependence), cigarette and EC use, and nicotine craving and withdrawal at baseline and week 6. Cotinine and exhaled carbon monoxide were assessed at baseline and week 6. **Results:** Participants who completely switched from smoking to ECs (exclusive EC users) and those that partially switched (dual users), maintained cotinine levels ($ps>.05$) and showed reductions in cigarette dependence and withdrawal ($ps<.01$). However, exclusive EC users showed no significant changes in total nicotine dependence from baseline to week 6 ($p=.123$), while dual users showed increased total nicotine dependence ($p<.001$). Dual users displayed similar levels of EC dependence as exclusive EC users but a lesser reduction in cigarette dependence. Exclusive EC users and dual users showed reductions in craving and withdrawal from baseline to week 6. **Conclusions:** The current study is among the first to prospectively examine changes in dependence, craving, and withdrawal among an understudied sample of smokers making a switch attempt. Smokers who completely switch to nicotine salt pod system ECs maintain nicotine levels and dependence, suggesting that pod-based ECs have a similar reinforcement profile to cigarettes and facilitate switching.

FUNDING: Federal

C-7

DOES MATERNAL NICOTINE METABOLISM MODERATE THE LINK BETWEEN MATERNAL CIGARETTE SMOKING AND INFANT BIRTH WEIGHT - A COLLABORATIVE PERINATAL PROJECT INVESTIGATION

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Significance: There is increasing recognition of the role that underlying biological mechanisms may play in modifying individual susceptibility to perinatal health outcomes. However, no studies have examined the effect of the phenotypic measurement of nicotine metabolism ratio (NMR; ratio of trans-3'-hydroxycotinine (3HC) to cotinine) on the relationship between maternal cigarette smoking and infant birth weight. We examined links between biochemically-validated maternal smoking, maternal NMR, and infant birth weight. **Methods:** Participants were 534 smoking mother-infant pairs (89% White, 11% Black) from the New England cohort of the Collaborative Perinatal Project (1959-1966), a multisite, prospective investigation of perinatal factors affecting birth and child outcomes. Maternal serum samples were gathered between gestation weeks 31-36 and assayed for cotinine and 3HC levels. Hierarchical linear regression models were used

to examine associations between maternal cigarettes smoked per day (CPD) during 3rd trimester, maternal NMR, and infant birth weight. Exploratory analyses also examined whether differences in NMR on infant birth rates were apparent when stratifying by race (White vs. Black smokers). **Results:** The interaction of maternal CPD and NMR was a significant predictor of infant birth weight (Beta=-.29, $p=.03$, $R^2=.16$). Specifically, pregnant smokers with slower NMR had significantly infants with lower birth weight compared to those with faster NMR among lighter smokers only, while no difference was found by metabolism rates among heavier smokers. Exploratory analyses stratified by race found that the model was significant among White smokers only ($F(6,464)=18.05$, $p<.001$), but not among Black smokers ($F(6,50)=1.46$, $p=0.20$). Black smokers were also disproportionately represented among lighter smokers with slower NMR. **Conclusion:** This is the first demonstration that maternal nicotine metabolism phenotype moderates the association between maternal smoking and infant birth weight. Infants of lighter smokers with slower nicotine metabolism - including disproportionate representation of Blacks - may be at heightened risk for morbidity from maternal smoking. As prevalence of new tobacco products use among pregnant women continues to increase, further targeted interventions among pregnant smokers may be warranted.

FUNDING: Federal; Nonprofit grant funding entity

C-8

SMOKING DEPRIVATION CONDITION AND TRAIT ANXIETY INTERACT TO PREDICT VARIABILITY IN SMOKING TOPOGRAPHY DURING AN EXPERIMENTAL RELAPSE ANALOG TASK

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Significance: Cigarette smokers with elevated anxiety experience greater quit difficulty and likelihood of relapse. Additionally, smokers with elevated anxiety may evince greater variability in how they smoke (i.e. puff topography), which is associated with worse nicotine dependence. Yet, no work has examined how anxiety may impact smoking behavior differentially across periods of smoking abstinence and non-abstinence. Therefore, the current study utilized puff level topography to examine how trait anxiety impacts smoking behavior during deprivation. **Method:** Thirty-nine daily cigarette smokers were randomly assigned to two counterbalanced visit types (abstinent and non-abstinent) during which the Relapse Analog Task was completed. Topography data, including puff volume, duration, and inter-puff interval were collected during the RAT using the Clinical Research Support System. Three-level multi-level models examined within-person (a) mean topography and (b) variability in topography, while controlling for the effects of CO and nicotine dependence. **Results:** There was no main effects for visit type for puff volume, but there was a significant visit type by anxiety interaction, whereby higher anxiety was associated with greater mean puff volume in the abstinent condition. Mean puff duration was greater during the abstinent condition, but there was no significant interaction with anxiety. There were no mean differences by visit type for inter-puff interval. In terms of variability, there was greater puff volume variability in the abstinent relative to non-abstinent condition. For puff duration, there was a significant interaction, such that anxiety was associated with greater variability in puff duration for the non-abstinent condition. Finally, for inter-puff interval, there was a significant visit type by anxiety interaction, whereby anxiety was associated with greater variability in inter-puff interval for the non-abstinent condition. **Conclusion:** Anxiety may be a particularly important predictor of variability in smoking behavior during abstinence. Targeting unique puffing behavior among smokers with elevated anxiety may be important to improving cessation outcomes.

FUNDING: Federal



C-9

INVESTIGATING THE IMPACT OF OPIOID AGONIST TREATMENT ON NICOTINE METABOLITE RATIO AMONG VULNERABLE SMOKERS

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Significance: Nicotine Metabolite Ratio (NMR) is a biomarker of nicotine clearance. Higher NMR is associated with heavier smoking, greater lung cancer risk, and decreased tobacco cessation. Roughly 20% of variability in NMR is attributable to environmental factors, and some data suggest that medications may influence NMR. Individuals with Opioid Use Disorder bear a disproportionate burden of smoking-related morbidity and mortality, and it is unclear whether opioid agonist treatments (OAT), such as methadone (MTD) and buprenorphine (BUP), influence NMR. **Methods:** This was a secondary analysis of data from a randomized controlled trial examining the effects of reduced nicotine content cigarettes on cigarette smoking among vulnerable populations. We used simultaneous multiple regression to compare square-root transformed baseline plasma NMR between smokers maintained on methadone or buprenorphine (Opioid Agonist Treatments, OAT) vs. smokers not receiving OAT adjusting for demographic characteristics and use of medications known to influence NMR. Analyses were repeated with a three-category predictor variable comparing BUP vs MTD vs non-OAT smokers. **Results:** Overall, participants (N=440, 55.2% female) smoked 18.7±9.6 cigarettes per day and with a mean baseline Fagerstrom total score of 5.8±2.4, indicating moderate dependence severity. OAT (n=193) and non-OAT (n=247) smokers did not differ on NMR in the primary analysis (0.48±0.2 vs. 0.48±0.3, respectively; $b = 0.02$, $p = 0.30$) although in the three-category analysis, NMR was higher among individuals receiving MTD (n=92, 0.54±0.2) vs. those receiving BUP (n=101, 0.43±0.2, $p = .01$) or non-OAT individuals (0.48±0.3; $p = .03$). In both analyses, older age, lower BMI, use of estrogen medication, and being of non-Latino White race were associated with higher NMR ($ps < .05$). **Conclusion:** We do not see evidence that OAT smokers generally have elevated NMR but receiving MTD may have elevated NMR. As higher NMR has been associated with greater nicotine dependence and poorer cessation and health outcomes, MTD-maintained smokers may require more intensive smoking cessation interventions for favorable outcomes.

FUNDING: Federal

C-10

SELF-REPORTED EFFECTS OF EXPOSURE TO CORRECTIVE STATEMENTS AMONG ADULTS MAKING A SMOKING CESSATION ATTEMPT

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Significance: A federal court ordered tobacco companies to disseminate corrective statements. This study examined awareness and impact of the corrective statements and federal court findings of tobacco industry fraud among adults trying to quit smoking. **Methods:** Participants (n=302) were adults participating in a tobacco cessation treatment study. Data were collected from October 2018 to July 2020. Participants were asked to read the 18 corrective statements and 10 federal court findings, and to report on their prior awareness of each. Using a 9-point scale, participants rated the extent to which this information made them feel afraid, worried about the health risks of smoking and secondhand smoke, and angry toward tobacco companies. Participants also rated their likelihood of quitting smoking and of supporting personal and workplace smoking bans. Descriptive statistics were generated. Differences in awareness were examined by sex, race, and income. **Results:** Participants were predominantly female (59.9%), White (59.9%) or Black (26.5%), with a mean age of 53.1 (SD=12.2) years. Most participants reported an annual income of <\$21,000 (53.2%). Participants smoked an average of 16.9 cigarettes per day (pre-quit) for 32.2 (SD=14.5) years. On average, participants reported prior awareness of 13.5 (SD=4.5) of the facts in the 18 corrective statements, and they were aware of 4.1 (SD=3.9) of 10 federal court findings. Many reported that this information made them feel extremely (rating=9) afraid (30.5%), extremely angry toward tobacco companies (42.7%), and extremely worried about the health risks of smoking (47.7%) and secondhand smoke (50.7%). After reading this information, most reported that they were more (81.5%) likely to completely quit smoking or to support a

law banning smoking in all workplaces (69.7%). Of those who had not already adopted personal smoking bans, many reported that they were more likely to ban smoking in their home (70.1%) or in their vehicles (75.0%). Hispanic/Non-Whites ($p < .001$) and females ($p = .038$) were less aware of the facts in the corrective statements, and there were similar disparities in awareness of federal court findings. **Conclusions:** Integrating exposure to court-ordered corrective statements and federal court findings as part of smoking cessation treatment may evoke strong emotions and improve self-efficacy for cessation while increasing support for adoption of personal and public smoking policies. Attention to disparities in awareness of the corrective statements and court findings may be warranted.

FUNDING: Federal; State

C-11

TREATMENT FIDELITY IN BEHAVIORAL TOBACCO CESSATION TRIALS - SCOPING REVIEW AND MEASUREMENT RECOMMENDATIONS

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Significance: Adoption of rigorous standards for reporting treatment fidelity is essential for advancing discovery and implementation of behavioral treatment. The Treatment Fidelity Workgroup of the NIH Health Behavior Change Consortium (BCC) identified treatment fidelity concepts for health behavior intervention research and developed an assessment tool to improve treatment fidelity across five key domains: treatment design, training, treatment delivery, treatment receipt and treatment enactment. The BCC assessment tool has not yet been applied to the reporting of treatment fidelity in tobacco cessation clinical trials. **Methods:** The SRNT Treatment Research Network sponsored this research and conducted a scoping review to: 1) summarize the current state of reporting treatment fidelity; and 2) make recommendations for best practices in reporting treatment fidelity in tobacco cessation trials. **Results:** Peer-reviewed articles (n=750) were identified that met the inclusion criteria: clinical trials of behavioral tobacco treatment interventions for adult tobacco users published in English between 2006 and 2018. Eligible articles were coded by two independent coders using the BCC treatment fidelity assessment tool. The most common study populations were smokers recruited from the general population (45%) and smokers with mental health or medical comorbidities (28%). The most common behavioral interventions were individual in-person counseling (71%), self-help (39%), and telephone counseling (30%). While fidelity measures related to the treatment design domain (e.g., treatment dose and duration, provider credentials) were commonly reported (68% averaged across all measures), other domains were rarely reported including detailed information on provider training (13%), treatment receipt (13%), and treatment delivery (12%). Only 12 studies achieved 80% reporting across >1 domain. **Conclusion:** These findings illustrate the lack of consistency in fidelity reporting in tobacco cessation trials and explain the challenges faced in evaluating rigor and reproducibility, as well as interpretation and dissemination of findings. Recommendations are made for enhancing fidelity reporting in tobacco cessation clinical trials.

FUNDING: Unfunded

C-12

EFFECTS OF PEER-FACILITATED TOBACCO CESSATION AMONG INDIVIDUALS IN A PRE-RELEASE PROGRAM AT ARIZONA DEPARTMENT OF CORRECTIONS

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Significance: Smoking prevalence among incarcerated individuals is estimated to be between 70%-80%, among the highest of any subpopulation. Although increasing evidence indicates that tobacco cessation interventions in corrections settings are feasible, effective, and highly desired among inmates, such services continue to be the exception rather than a standard of care. Responding to this critical service need, the Arizona Department of Health Services (ADHS) launched a series of efforts to bolster cessation services in correctional settings throughout the state. These efforts



have culminated most recently in the Arizona Justice-Involved Cessation Extended Pilot Project, launched in Fall of 2019 to test a peer-facilitated, train-the-trainer cessation program, the University of Colorado's DIMENSIONS: Tobacco-Free Program. **Methods:** DIMENSIONS is an evidence-based intervention utilizing a motivational assessment along with six group-based sessions. The pilot project was tested within a pre-release program in which selected inmates are taught skills and resources they will need to successfully reenter society. From December 2019 through March 2020, a total of 39 individuals were enrolled in one of three consecutive DIMENSIONS groups. Participants provided weekly self-reported data on tobacco use, quit attempts, use and importance of NRT, and readiness to live a tobacco free life post-release. **Results:** Analyses revealed a significant reduction in tobacco use among participants over the course of group participation. A quarter of the sample reported successful cessation, and nearly 80% of the sample reported making at least one quit attempt. Participants reported increased knowledge, confidence, and receiving support to live a tobacco-free life post release. **Conclusions:** To our knowledge, this study offers the first evidence that peer-facilitated cessation programming is effective and feasible for incarcerated individuals. In light of the advantages offered by peer-facilitated programming over internal corrections employee-led programming (namely cost effectiveness and sustainability) larger-scale efficacy trials are warranted.

FUNDING: State

C-14

SMOKING CHARACTERISTICS IN THE HISPANIC/LATINX POPULATION: DIFFERENCES ACROSS SUBGROUPS BY MEN AND WOMEN

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SIGNIFICANCE: Hispanic/Latinx smokers are often erroneously treated as homogeneous. To better characterize the diversity of smoking experiences and perceptions across Hispanic/Latinx subpopulations, we compared a large US-based smoking cessation sample by sex and country of origin. Differences could inform whether cessation interventions should be tailored by subgroups and/or sex among US Hispanics/Latinxs. **METHODS:** Baseline data from a nationwide smoking cessation trial with 1417 Spanish-prefering adults compared smoking characteristics and beliefs by subgroups [Puerto Rican (n=235), Cuban (n=316), South American (n=125), Central American (n=87), Mexican (n=477), Dominican (n=37), Other (n=20), and multiple countries of origin (n=113)], and then by sex within subgroups with n > 120. Dependent variables included years smoked, cigarettes per day (CPD), smoking frequency (daily vs non-daily), positive and negative smoking expectancies (Smoking Consequences Questionnaire) and abstinence self-efficacy. We used the Holm-Bonferroni method to control the familywise error rate. **RESULTS:** Subgroups varied in CPD, smoking frequency and many expectancies scales (Ps<.01). Overall, Cubans smoked more CPD (Ps<.002), were more likely to be daily smokers (Ps<.002) and reported greater positive expectancies (Ps<.002). Among Puerto Ricans and Cubans, men smoked more CPD than women after controlling for age (Ps<.003). Among Mexicans and Cubans, men had smoked longer than women (Ps<.003). Among Puerto Ricans, men reported greater positive expectancies than women (P<.003). No significant differences were observed across subgroups or by sex within subgroups in negative expectancies or abstinence self-efficacy. **CONCLUSION:** Results demonstrated differences across subgroups in smoking patterns and positive expectancies, as well as between men and women within some subgroups. These findings support the heterogeneity within Hispanic/Latinx smokers, suggesting the potential value of more specific tailoring of interventions for this population.

FUNDING: Unfunded; Federal; State; Academic Institution

C-15

A BRIEF MINDFULNESS-BASED INTERVENTION FOR NICOTINE ABSTINENCE-INDUCED HYPERALGESIA AMONG DAILY CIGARETTE SMOKERS WITH CHRONIC PAIN

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Experimental data indicate that smokers experience increased sensitivity to pain during the early stages of abstinence, and it has been posited that abstinence-induced hyperalgesia could precipitate relapse among smokers with chronic pain. Mindfulness-based interventions have demonstrated utility in the context of both chronic pain and tobacco cessation. The goals of this pilot study were to assess the feasibility of administering a brief mindfulness-based intervention to reduce smoking abstinence-induced hyperalgesia, and to generate initial effect size estimates. Current smokers with chronic pain (N = 18, 78% male, $M_{age} = 43.4$, $M_{CPD} = 19.2$) were randomized to either brief mindfulness (BM) or control intervention conditions. The BM intervention focused on encouraging participants to practice mindful awareness and acceptance using a "Being in the Moment" exercise (Dahl & Lundgren, 2006), whereas the control intervention focused on pain psychoeducation. Pain intensity and experimental heat pain tolerance (via Medoc Q-Sense device) were assessed at baseline, and following 2- and 24-hours hours of nicotine deprivation. In terms of feasibility, we observed a 94% retention rate and 71% compliance with 24-hour smoking abstinence. All BM participants reported practicing mindfulness during pain testing, and all but one reported practicing during the 24-hour deprivation period (M number of practice sessions = 5.6; SD = 3.5). Pain ratings were in the expected direction, with BM (vs. control) participants reporting lower pain intensity and greater tolerance following 2- and 24- hours of nicotine deprivation. Partial eta squared coefficients indicated medium-to-large effect sizes. Collectively, these data provide initial support for the notion that mindfulness-based interventions are feasible and may have utility in the reduction of abstinence-induced hyperalgesia among smokers with chronic pain. Future research (e.g., adequately powered randomized controlled trial) is needed to determine the efficacy of mindfulness- and acceptance-based approaches for the reduction of abstinence-induced hyperalgesia among smokers with chronic pain.

FUNDING: Academic Institution

C-16

PILOT OF A TEXT MESSAGING-BASED INTERVENTION FOR SMOKING CESSATION AMONG YOUNG PEOPLE EXPERIENCING HOMELESSNESS

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Significance. Rates of cigarette smoking are alarmingly high among youth experiencing homelessness (YEH), yet there are no evidence-based programs for this population. This presentation shares results from a pilot evaluation of a text messaging-based smoking cessation treatment, as an adjunct to brief group cessation counseling and pharmacotherapy, to improve abstinence rates among YEH smokers. **Method.** Seventy-seven YEH smokers (ages 18-25) who had a working cell phone with them at the recruitment visit were randomized to receive a standard group counseling session, nicotine patches, and written material on quitting, or a similar program that piloted a 6-week automated text messaging intervention (TMI) to provide ongoing support for quitting. Smoking outcomes were evaluated through a 90-day follow-up (retention rate: 86%). **Results.** Only 14% (out of 229) of screened individuals were ineligible for study participation due to not having a phone that could receive text messages or not wanting to receive messages. Participants in the TMI condition experienced interruptions in their phone use, but reported being able to receive the majority of text messages, with backend data showing a message delivery rate of about 95%. Survey results indicated high (typically above 70%) approval of most TMI components. The 7-day point prevalence abstinence rate was higher in the TMI condition than the standard condition (19.44% vs. 10.00%, respectively; Cohen's $h = .27$), as was the reduction in number of days smoked in the past 30 days from baseline to follow-up (-14.24 vs. -8.62, respectively; Cohen's $d = .49$). Secondary analyses examined intervention effects on other substance use (e.g., other tobacco products, alcohol, marijuana), depression, and anxiety. **Conclusions.** Adding a 6-week TMI support to a brief group counseling and pharmacotherapy protocol holds promise for cigarette smoking reduction and abstinence among YEH smokers. Results indicate that a larger-scale evaluation of the TMI with longer follow-up period is warranted.

FUNDING: State

**C-17****CHANGES IN CESSATION FATIGUE AMONG SMOKERS IN A MEDICATION SAMPLING TRIAL**

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Previous research suggests that cessation fatigue (CF; i.e. tiredness of trying to quit smoking) is one factor that may lead to lower incidence of quit attempts and relapse among those attempting to quit. It is unclear if CF: a) differs as a function of motivation to quit, or b) changes as a function of treatment, and c), if so, whether that relationship differs by motivation. In this pilot treatment study, motivated (MTQ) and unmotivated-to-quit (UMTQ) smokers were randomized to 1) varenicline sampling, in which participants received a 1x, 1-month supply of varenicline (VRN) to use as they wished, or 2) a no sampling control group. The sampling exercise suggested, but did not require, an attempt to quit. A total of 99 smokers were recruited in South Carolina and followed for 3 months. For purposes here, changes in CF were analyzed after 1 month, concurrent with medication sampling exercise under the rationale that VRN would mitigate fatigue over time. CF was measured with both an 8-item scale focused on emotional exhaustion, with total scores ranging 1-5 (Cronbach's alpha =.76) and also a 1-item measure that was derived from other studies. Participants averaged 41.7 (SD=12.2) years of age, smoked 16.8 (7.4) cigarettes/day, and were 56% female and 24% non-white. At baseline, MTQ and UMTQ smokers did not differ on emotional exhaustion, nor on the single item assessment of CF. CF increased over the course of 1-month follow-up, no matter how measured. Though group differences were not significant, emotional exhaustion increased less for MTQ/VRN (+ 5%) compared to MTQ/Control: +25%, UMTQ/VRN: +25% and UMTQ/Control: +22%. In contrast, single item assessment of CF showed an opposing pattern of CF change over time: UMTQ/Control: +45%; MTQ/Control: +59%; UMTQ/VRN: +12%; MTQ/VRN: +53%. Cessation fatigue is a complicated construct to assess and increased over time for all groups in the context of this naturalistic sampling study. Future studies are needed to understand the trajectory of this construct within a treatment outcome trial as well as determine the best way to measure it. Whether medication/varenicline sampling mitigates cessation fatigue is unclear.

FUNDING: Federal

C-18**HOW UNDERSTANDING CHANGE EXPERIENCE IN SMOKING CESSATION MIGHT INFORM TREATMENT DEVELOPMENT**

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SIGNIFICANCE: Cigarette smoking remains the leading preventable cause of death and disability in the U.S. However, despite effective cessation treatments and treatment dissemination strategies, less than 1/3rd of the population use proven cessation methods. Qualitative methods can highlight limitations and identify novel adaptations to existing cessation treatments that may increase treatment engagement, adherence, and success. **METHODS:** Using rapid qualitative analysis, we examined smokers' insights into changes needed to quit. 125 adult daily smokers (48% female; 44% White) participating in a smoking cessation clinical trial completed audio-recorded and transcribed individual qualitative interviews 2 weeks pre-quit and 2 weeks post-quit reporting changes they *planned* to make (pre-quit) and those they *made* (post-quit). **RESULTS:** Planned changes in order of frequency were: identify triggers (e.g., stress, habit, and smoking urges) without a plan to cope with them, focus on benefits of quitting, reduce exposure to other smokers, make other health changes, reduce exposure to non-social smoking cues, reduce alcohol consumption, get support from loved ones, identify plan to deal with stress, use cessation medications, and 'don't know.' Over one-third of participants did not report any planned changes. Changes known to increase cessation success (e.g., use cessation medications, reduce drinking) were least commonly planned. Changes that were *made* included: 4 D's (drink water, delay, deep breathing, distract), reduce exposure to non-social cues, focus on benefits, change daily routine, make other health changes, reduce smoker exposure, no changes made, get support from loved ones, reduce alcohol consumption, identify plan to deal with stress, and use medication. The most commonly made changes are consistent with clinical practice guidelines, but cessation medication remained the least commonly reported theme. **CONCLUSIONS:** While many smokers may not have a plan for quitting, they recognize the importance of triggers and report using instructed cessation methods. Incorporating identified triggers into a personalized cessation plan while increasing motivation for cessation medication may improve cessation treatment engagement and success.

FUNDING: Federal

C-19**MINDFUL BREATHING WITH OR WITHOUT CONTROLLED YOGIC BREATHING PROMOTES SMOKING ABSTINENCE: A PRELIMINARY LABORATORY INVESTIGATION**

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Most smokers report a desire to quit smoking and many try to quit, however, despite significant advances in nicotine dependence treatments, many result in high relapse rates. Smokers have difficulty quitting due negative affect, craving, and other tobacco withdrawal symptoms. Clinical studies have demonstrated that mindfulness interventions promote smoking cessation by alleviating negative symptoms of withdrawal. Mindful breathing, sometimes consisting of mindful attention to breath and sometimes also involving controlled yogic breathing, is one of many components of mindfulness interventions. Deep breathing has long been recommended as a coping strategy for smokers, but there is surprisingly very little research investigating its beneficial effects on smoking outcomes (e.g., cravings, relapse). Mindful attention to breath is often a component of mindfulness-based interventions for smoking, but there has been little research investigating its unique effects on smoking outcomes including affect, craving, withdrawal, and smoking behavior. The aim of this study was to test the effectiveness of mindful attention to breath with and without a controlled yogic breathing component on smoking behavior. Twelve-hour abstinent daily smokers (N = 36; 39% female; M = 9.89 cigarettes per day; 69% African American) were randomly assigned to a 20 minute intervention consisting of 1. mindful attention to breath (MB), consciously paying attention to the natural flow and rhythm of their breath; 2. mindful attention to breath with controlled yogic breathing (MYB); or 3. no-treatment (NT) control. During a 50-minute smoking versus money choice task, both MB and MYB significantly reduced the risk of smoking compared to NT with no significant differences between the two. The MB group reported greater increases in feelings of serenity compared to MYB and NT. There were no effects for negative or positive affect, craving, tobacco withdrawal, or state mindfulness. In this preliminary investigation, controlled yogic breathing did not enhance the effectiveness of MB. MB is an easily disseminable and cost-effective strategy that may promote smoking abstinence and should be further explored.

FUNDING: Academic Institution

C-20**EVALUATION OF MAINTENANCE OF PROACTIVE TELEPHONE OUTREACH IN COMPREHENSIVE CHRONIC CARE SYSTEM TO PROMOTE SMOKING CESSATION IN PRIMARY CARE**

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Background: Effective smoking cessation treatments are underutilized in primary care. Proactive outreach may increase the reach of smoking cessation treatments. **Objective:** To evaluate maintenance of proactive outreach to offer smoking cessation treatments to patients on a smoking registry. The reach of proactive telephone calls to 2 patient groups, those not seen in clinics in the past year and those seen in clinics in the past 2 weeks who do not yet have a smoking cessation plan, were modeled over time. **Methods:** Proactive outreach to patients on a smoking registry was implemented in 6 primary care clinics in a Midwestern healthcare system between January 2018 and June 2020. Tobacco cessation outreach specialists (TCOS) called smoking registry patients not seen in clinic in the past year and patients seen in the past 2 weeks without a documented stop-smoking plan. Regression analyses were conducted to examine linear changes in rates of connecting with patients, quit date setting, counseling acceptance, and smoking pharmacotherapy acceptance over 30 months of program implementation. **Results:** Rates of reaching patients ranged from 40% to 71% across months, and no significant reduction in rates of reach occurred over time. Among patients recently seen in clinic who were reached by TCOS, rates of setting a quit date ($\beta = -0.016$, SE= 0.004; range of rates 5% to 100% across months), counseling acceptance ($\beta = -0.016$, SE= 0.004; range 7% to 100%) and acceptance of cessation medication ($\beta = -0.009$, SE= 0.003; range 8% to 100%) declined modestly over time ($p < .01$). Among those not seen in clinic in for a year or more, rates of setting a quit date ($\beta = -0.009$, SE= 0.001; range of rates 3% to 41% across months), counseling acceptance ($\beta = -0.012$, SE= 0.002; range 0% to 47%) and acceptance of cessation medication ($\beta = -0.008$, SE= 0.001; range 3% to 40%) were lower overall, but declined at a slower rate over time ($p < .0001$). **Conclusions:**



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Proactive outreach to smokers not involved in effective smoking cessation treatment reached 40% to 71% patients over 30 months of implementation, with only modest declines over time in engagement in quit day planning and acceptance of treatment.

FUNDING: Federal

C-21

QUIT EXPERIENCES AMONG PRIMARY CARE PATIENTS ENROLLED IN A SMOKING CESSATION PILOT RCT DURING THE COVID-19 PANDEMIC

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SIGNIFICANCE: The impact of the COVID-19 pandemic on US adults' smoking and quitting behaviors is unclear. We explored reactions to treatment, behaviors and risk perceptions among primary care patients trying to quit during the pandemic. **METHODS:** In Jan-March 2020 we enrolled 25 smokers from MA practices into a 12-week pilot trial (NCT04020718) with qualitative exit interviews on trial experiences during the pandemic. Treatments included text messages (SMS) tailored to readiness to quit: "ready in next 30 days" or "not ready," with mailed NRT and telephone coaching for non-responders. Interviews were thematically analyzed by 2 coders. **RESULTS:** 22 participants (88%) completed interviews (46% female; 82% white; M=55 years old [SD= 14]; 18% PHQ-2 ≥ 3 ; 50% GAD-2 ≥ 3); 4 (16%) reported abstinence at 12-weeks. Themes included (1) mixed evaluation of the texts, (2) varied response to COVID-19 induced environmental changes, and (3) consistent risk perceptions. SMS provided positive support for some, while others were distressed when a SMS came from the study and not a loved one. COVID-19 related environmental changes negatively affected quitting for most. Being home led to smoking due to boredom. Stress increased, especially among frontline workers who used smoking as a coping mechanism. Social distancing had mixed effects, facilitating quitting for some who spent less time around smokers, but isolation gave others more freedom to smoke. In general participants perceived no increased risk of COVID-19 infection, believing it to be due to exposure to other people and not to smoking. However, they believed that smoking and its effects on their lungs increased their risk of severe outcomes including death, were they to be infected. **CONCLUSION:** Smokers engaged in a cessation trial during a stay-at-home advisory varied in their reports of the impacts of the pandemic on their desire to quit and the effects of social distancing on quit attempts. Participants felt at risk for COVID-19 complications, but not at increased risk for becoming infected. Understanding these varied experiences and common risk perceptions can be used to tailor support for smokers during public health crises.

FUNDING: Academic Institution; Other

C-22

PERCEPTION OF A MULTIPLE HEALTH BEHAVIOR CHANGE INTERVENTION AMONG SMOKERS WITH OBESITY

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Significance: The life expectancy of smokers with obesity is considerably shorter than that of normal weight smokers. Smokers with obesity endorse more disinhibited eating than normal weight smokers, more concern about post-cessation weight gain, and less confidence in their ability to maintain their weight without smoking. These findings point to the importance of developing interventions to address processes that are shared in tobacco use disorder and obesity in order to reduce the disease burden in this comorbid population. The goal of the current study was to conduct qualitative focus groups with cigarette smokers with obesity to inform the intervention design of a multiple health behavior change intervention designed to help smokers with obesity quit smoking with minimal weight gain. **Methods:** Four qualitative focus groups were conducted with individuals who smoked cigarettes and who were also overweight or obese to explore attitudes and perceptions about a combined health intervention focused on smoking cessation and weight management, to better understand their past experiences with trying to quit smoking or to manage their weight, and the ways in which their smoking and weight impact each other. All focus groups were transcribed and transcripts were independently coded using NVivo qualitative software by two raters using a coding dictionary based on a priori and emergent themes. A third coder met weekly with coders to discuss and resolve coding discrepancies in order to achieve consensus in coding decisions. **Results:** Participants expressed interest in an intervention with a dual focus on quitting smoking and weight management. With regard to past smoking cessation attempts, many participants reported being fearful of using nicotine replacement therapy, disliking it, and perceiving it to be dangerous. The complex interrelationships between weight management and smoking cessation were often noted. Particularly, concern

regarding how additional smoking-cessation related weight gain would impact them was frequently expressed and endorsed as a deterrent from quitting smoking. **Conclusions:** Several themes emerged including excitement regarding an intervention focused on both smoking and weight, concern regarding cessation-related weight gain, and a lack of knowledge and experience with evidence-based smoking cessation and weight loss approaches. Groups provided insight into key areas to highlight in a combined intervention including the importance of environmental and contextual factors that have interfered with success in both domains.

FUNDING: Federal

C-23

SMOKING CHARACTERISTICS OF NON-PARTICIPANTS IN A PRAGMATIC TRIAL OF BRIEF INTERVENTIONS FOR SMOKING EXPECTANT FATHERS

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Significance: Pregnancy is a teachable moment to engage male partners of non-smoking pregnant women in smoking cessation, but evidence on how to best approach these smokers is scarce. We developed a proactive model to enroll smoking expectant fathers in a trial of brief cessation interventions and compared the smoking behaviors between participants and non-participants. **Methods:** We did a pragmatic randomized clinical trial in antenatal clinics in 7 public hospitals in Hong Kong (ClinicalTrials.gov: NCT03671707), in which researchers proactively approached and recruited male partners of pregnant women. Eligible subjects were daily cigarette smokers aged 18+ years living with their non-smoking pregnant partners. Descriptive statistics were used to compare the smoking characteristics between the trial participants and non-participants. **Results:** From Oct 2018 to Feb 2020, 1053 of 1415 (74.4%) eligible smokers consented to participate in the trial. 325 of 362 (89.8%) who declined to participate provided data on their smoking behaviors. Trial participants and non-participants had similar median [IQR] numbers of cigarette per day (10 [5-15] vs 10 [6-15], P=0.28), heaviness of smoking index (1 [0-3] vs 1 [0-3]; P=0.28) and exhaled carbon monoxide levels (14 [8-22] vs 15 [9-23] part per million, P=0.49). However, significantly greater proportions of trial participants than non-participants reported having reduced their smoking consumption (48.4% vs 44.5%) and made a quit attempt (3.4% vs 1.3%) since their partners become pregnant (P=0.037). The proportion of non-participants who reported smoking near their partners in the past 7 days was higher than that of trial participants (31.0% vs 22.0%; P=0.001). **Conclusion:** In this pragmatic smoking cessation trial for expectant fathers, non-participants appeared to be more reluctant to change their smoking behaviors in response to their partners' pregnancy. Efforts to optimize the recruitment strategy, including health messaging on the hazards of maternal and child exposures to tobacco smoke, are needed to motivate these smokers in smoking cessation treatment and address the high prevalence of smoking near pregnant women.

FUNDING: Nonprofit grant funding entity

C-24

THE FEASIBILITY OF IMPLEMENTING LEARN2QUIT, A TEXT MESSAGING TOBACCO CESSATION SUPPORT PROGRAM, FOR CANCER SURVIVORS AT ROSWELL PARK COMPREHENSIVE CANCER CENTER

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Significance. The prevalence of tobacco use among cancer survivors (CS) remains unacceptably high. Through the C3i initiative, significant improvements have been made in the identification and referral of tobacco users at cancer centers, but relatively few CS engage in evidence-based tobacco treatment. Even though all CS who use tobacco at Roswell are offered counseling in different modalities, only 6.4% agree to tobacco treatment. Innovative methods are needed to engage CS in effective tobacco cessation support. Theory-based text messaging programs (TMP) are effective supports for smoking cessation, but have not been examined among CS. This study examined the feasibility of implementing Learn2Quit, a TMP for CS referred to the Roswell Park Tobacco Treatment Service (TTS). **Methods.** The Learn2Quit text message library, structure,



and approach were adapted from an evidence-based cognitive-behavioral treatment manual. Learn2Quit guides recipients through weekly goals and the development of cognitive-behavioral skills for tobacco cessation. Multiple opportunities are provided for interactive feedback and suggestions to contact the TTS are frequently provided to help with specific challenges. All patients at Roswell are assessed for tobacco use every 90 days. All tobacco users are automatically referred to the TTS. All referrals received by the TTS from July 14 to August 3, 2020 were offered Learn2Quit. **Results.** Approximately 9.5% (n=28/292) of referrals enrolled in Learn2Quit, 13 (46.4%) of whom engaged in telephone counseling with the TTS and 15 (53.6%) who refused counseling. To date, n=4 opted out, most because they received too many texts; n=14 responded to interactive prompts with n=33 responses. To date, n=1,336 outbound texts were sent. One CS enrolled in Learn2Quit contacted the TTS in response to a prompt from Learn2Quit. **Conclusions.** Initial findings suggest that some CS who use tobacco are interested in text messaging support. Offering text messaging support might engage more CS in supportive treatment who might not otherwise engage in tobacco treatment services. Interactive components and prompts to contact the TTS might provide opportunities to engage CS in more intensive tobacco treatment services.

FUNDING: State

C-25

UNDERSTANDING ENGAGEMENT BEHAVIORS AND RAPPORT BUILDING IN TOBACCO CESSATION TELEPHONE COUNSELING: A QUALITATIVE ANALYSIS OF RECORDED COUNSELING CALLS

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Significance: Telephone counseling is an effective smoking cessation treatment. Engagement and rapport building are key to both patient-provider alliance and treatment retention but are understudied. Operationalizing patient and provider engagement behaviors during telephone counseling could inform tailored, scalable outreach. **Methods:** We analyzed a random sample of audio-recorded tobacco cessation counseling calls requested by recently hospitalized patients enrolled in a smoking cessation trial (Helping Hand 4 [NCT03603496]) during scheduled outreach (n=43 calls; 37 smokers). Three coders identified engagement behaviors during calls. Coding matrices were used to compare engagement behavior codes by participant depression (mod-severe: PHQ8 \geq 10), anxiety (mod-severe: GAD7 \geq 10) and treatment outcome (self-reported 7-day abstinence at 6-months). Analysis was organized using NVivo 12. **Results:** Patients were 62% female, 70% white, median age 58. Mod-severe depression (49%) and anxiety (60%) were common. At 6-months, mean calls completed=4, 42% had quit smoking. Patient-led engagement behaviors included reference of past quit attempts, asking questions, embellishment, change talk, and expressed importance of live calls. Counselor-led behaviors included building off prior interaction, empathy, normalizing challenges, reframing and summarizing, validation of achievements, and expression of shared experience. General discussion and humor were engagement strategies employed in tandem. Patient-led engagement behaviors were more frequent in calls with patients who had moderate-to-severe depression (m=6.1) and anxiety (m=5.1) vs. those with lower scores (m=3.6 and 3.5, respectively). Both counselor and patient-led engagement behaviors were more frequent in calls with patients who continued to smoke during the study (m=14.4) compared to calls with those who quit smoking (m=11.3). **Conclusion:** Increased rapport-building and engagement via telephone counseling may be important for smokers with psychiatric symptoms and those having difficulty quitting. For individuals without psychiatric symptoms or who have already quit, less intensive engagement for relapse prevention may suffice.

FUNDING: Federal

C-26

WHY DID CAMBODIAN HIV-POSITIVE SMOKERS QUIT AND RELAPSE? FINDINGS FROM A MIXED-METHODS DATA ANALYSIS

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Significance: This mixed-methods analysis aimed to explore salient reasons why Cambodian HIV-positive smokers quit and relapsed during their participation in a smoking cessation pilot trial. Findings will help improve future tobacco cessation treatments. **Methods:** We used the explanatory sequential design, with a pilot two-group single-blind

randomized controlled trial (N=50) to evaluate our smartphone-delivered Automated Messaging (AM) program versus standard care (SC) for smoking cessation among HIV-positive people in Cambodia, followed by in-depth interviews with all participants at the end of the trial (2 months post enrollment). Participants in both groups were asked to complete weekly smartphone-delivered ecological momentary assessments (EMA) via our Insight™ app, which assessed their smoking status in the past week for the entire study duration. Qualitative data were obtained through open-ended questions regarding why participants quit or did not quit and what they underwent. In this joint analysis, we used the integration strategy of explaining with the intent to explore why participants quit and relapsed by different smoking/abstinent patterns in the EMA throughout the treatment course. **Results and Conclusion:** For those who quit and stayed abstinent, salient motives to quit included to protect their own health, to avoid the potential influence of smoking on HIV condition/treatment, to protect their children's health, and to save money. Being able to avoid other smokers, having coping skills, and having social/familial support also contributed to successful abstinence. In contrast, smokers who did not make any quit attempt indicated that they (i) were heavily addicted to cigarettes; (ii) were not able to avoid other smokers, particularly at their workplaces or in their business; and (iii) were stressed, particularly due to their HIV condition. Similarly, salient reasons for relapse or repeated relapse(s) included being around other smokers, being stressed, and lack of support from family. Future smoking cessation interventions for this population may need to address these factors and consider the intertwinement of these factors and their HIV condition.

FUNDING: Federal; State

C-27

INITIAL MIXED METHODS FINDINGS FROM SMARTPHONE BASED SMOKING CESSATION APPS WITH AMERICAN INDIAN ADULTS

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Significance: American Indians (AIs) have some of the highest smoking rates in the US, and subsequently, experience disproportionate rates of smoking-related cancers and mortality. While many AI current smokers want to quit, they have less successful quit attempts compared to other ethnic groups. There is a critical need to address health disparities in adverse smoking-related outcomes among AIs by developing and improving access to acceptable, effective, and culturally relevant smoking cessation interventions. **Methods:** This study is part of a large (proposed n=450), ongoing 26-week randomized controlled trial that compares two smoking cessation mobile health (mHealth) interventions (NCI QuitGuide vs. Smart-T3). All participants complete baseline surveys, daily smartphone-based ecological momentary assessments, and receive combination nicotine replacement therapy and smartphone-based cessation content. A sequential explanatory mixed methods study was conducted with AI participants (n=5) using interview data that were collected following the 26-week intervention (i.e., NCI QuitGuide and Smart-T3 apps). Two items from the final survey, which assessed likelihood of recommending the app to others and self-perception of survey completion, were analyzed. **Results:** Participants were male (80%) and 46 years old (SD=14.2). Participants were somewhat likely, on average, to recommend the cessation app to a friend who smokes, and reported their daily survey completion rate either stayed the same (n=2) or decreased (n=3) during the 26-week study period. Initial findings indicate that participants' recommendations for culturally modifying the apps included incorporating video messages from tribal/family members (n=5), additional reminders/quitting tips (n=3), and social support/on-demand counseling for cessation (n=3). Participants' identified technology issues as barriers to using the apps (n=2). **Conclusions:** Smoking cessation interventions delivered via mHealth offer promise in reducing tobacco-related health disparities among AI smokers. Findings from this study will inform cultural modification of the study apps for AIs who want to quit smoking.

FUNDING: Federal; State; Academic Institution



C-29

REQUIRING COACHING AND NOT REQUIRING COACHING TO OBTAIN NICOTINE REPLACEMENT THERAPY (NRT) USING AN ONLINE APPLICATION THROUGH THE NEW YORK STATE SMOKERS QUITLINE (QL): A COMPARISON OF CONCURRENTLY APPLYING DIFFERENT ENROLLMENT CRITERIA FOR DIFFERENT NYS REGIONS

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Significance: The QL offered NRT using an online application to extend reach and increase capacity. Those eligible were mailed NRT and weren't required to have a coaching call but a call was offered after receiving the NRT. In 2016 a coaching call became required *prior* to receiving the NRT to better support quit success. But this requirement was waived for NYC area applicants resulting in two different applications; one *without* coaching required to receive NRT and another *with* coaching required outside of NYC area. Comparing differing eligibility applications can inform around user reach, engagement, acceptance of calls, quit and satisfaction outcomes. **Methods:** Data was collected prior to requiring a coaching call to get NRT and included number of applicants, callback engagement rates, quit and satisfaction rates. Post requirement amendment, the same data was collected for both applications except for the application that required a call prior to receiving NRT engagement rates were collected for the required coaching call. This data was analyzed to compare outcomes among baseline and the two post NRT applications. **Results:** Between 6/1/2011 and 5/31/2016, 246,867 applied online for the NRT and 56% received NRT **with no call required**, 18% took the follow up call, 83.2% reported mostly or very satisfied and quit rates were 31.4%. Post eligibility coaching requirement between 8/1/2016 and 7/31/2019 show that where the **no call requirement remained 20,974** applied for the NRT, 49% got the NRT, 43% took the follow up call, 89.3% reported satisfaction and quit rates were 33%. For the application that **required the call prior to receiving** 19,181 applied for the NRT, 43% got the NRT, 52% took the required Intake call, 36% answered a follow-up call and 89% reported satisfaction and quit rates were 28%. **Conclusion:** Outcomes show compared to not requiring a call to receive NRT with an online application vs. requiring a call does not significantly reduce applicants but reduces the number receiving NRT and accepting calls yet satisfaction and quit rates were comparable. Requiring the coaching call does not appear to increase quit rates and reduces numbers receiving the NRT.

FUNDING: State

C-30

ASSESSING THE IMPACT OF THE COVID-19 PANDEMIC ON CANCER PATIENTS ENROLLED IN A TOBACCO CESSATION PROGRAM

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The COVID-19 pandemic has affected people physically and emotionally, but 8 months into the pandemic, we are only just beginning to understand the impact of the COVID-19 on individual health-related behavior. We examined the influence of the COVID-19 pandemic-related stress and lifestyle changes on tobacco treatment and quit status of cancer patients enrolled in a tobacco cessation program at a large urban academic center. Our survey, administered by tobacco treatment specialists, asked cancer patients about their smoking/quit attempts, COVID exposure/risk, preventive behaviors, home/work environment, emotional health/stress, and cancer care. Of the 21 patients surveyed, 52.4% were female, 55% non-Hispanic white, and 28.6% black; mean age 64.3 years. Thirteen (61.9%) were continuous smokers, 3 (14.3%) recidivist smokers (once quit but have since resumed smoking), and 5 (23.8%) had quit (1 prior to COVID and 4 after). Three patients who had previously quit resumed smoking and three smokers quit during the time since March 2020. Self-reported mental/emotional health after the onset of COVID was associated with smoking status, with 66.7% of recidivist smokers and 38.5% of continuous smokers reporting it as "good" ($p=0.035$). In addition, all individuals who quit reported being less physically active vs. 66.7% of recidivists and 38.5% of continuous smokers ($p=0.01$), but there was no change in sleeping patterns ($p=0.77$) or social interaction ($p=0.43$) by smoking status. One-third of patients who had quit reported staying at home made them want to smoke again, while 21.4% of smokers felt staying at home made them want to smoke more. Amongst smokers, 80% were not worried that smoking would increase their risk of getting COVID, and 56.2% were not worried that being a smoker could lead to a more severe case if

infected. Wearing a mask and desire to smoke was associated with smoking status with all recidivist smokers reporting that wearing a mask made them want to smoke more and 46.1% of continuous smokers reporting mask wearing made them want to smoke less ($p=0.001$). Further study is needed to better understand how COVID impacts cancer patients who are trying to quit smoking.

FUNDING: Federal

C-31

PROTOCOL AND INITIAL FINDINGS FROM A VIDEO/PHONE SMOKING CESSATION INTERVENTION FOR LATINX WHO SMOKE AND HAVE COMORBID DEPRESSION AND/OR ANXIETY

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Significance: Latinx adults and individuals with behavioral health challenges experience tobacco-related disparities related to cessation treatment. More research is needed to consider Acceptance and Commitment Therapy (ACT) an evidence-based intervention for the co-occurrence of smoking and depression and anxiety, including among Latinx adults. **Method:** This one-arm feasibility study aims to develop and pilot test an ACT-based intervention for Latinx adults who smoke and have depression and/or anxiety symptoms ($N=38$). The work include the development of clinician and participant manual and evaluation of feasibility of recruitment, retention, and treatment acceptability. Adjustments were necessary due to the COVID-19 pandemic. The intervention entails one video session and seven telephone-delivered sessions, and nicotine patches. Baseline and follow-up assessments include demographics, tobacco use, depression, anxiety and psychological traits relevant to ACT. **Results:** Protocol related materials are developed and complete. Recruitment is ongoing and has been challenging. The first cohort of 13 participants have been enrolled to date, out of which six persons completed the study, one withdrew and six are in progress. The majority of participants are women ($n=8$; 61%), ranging from young adult to mid-age, living with a partner, and working at least part-time at the time of the pandemic. Average number of sessions completed is six. Most participants did not want to use nicotine patches. The quarantine circumstances of the pandemic have motivated many individuals to quit smoking, but it has had mixed-effects in their ability to do so, mostly contingent on how the quarantine exacerbated previously existent challenging psychosocial conditions. **Conclusion:** This presentation will describe the study procedures, findings related to feasibility and acceptability of this ACT-based video/phone delivered treatment, and lessons learned related to recruitment and implementation as well as participants' experiences quitting smoking during the COVID-19 pandemic.

FUNDING: Federal; Nonprofit grant funding entity

C-32

NICOTINE REINFORCEMENT THRESHOLD IN YOUNG ADULT LIGHT SMOKERS

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Significance: The nicotine content of inhaled tobacco products is a potential target to prevent the development of nicotine addiction, but the threshold for nicotine reinforcement has not been systematically evaluated in controlled human laboratory studies. The current study uses a novel double-blind placebo-controlled intravenous (IV) nicotine self-administration model. **Methods:** Young adults ($n=35$; 68% male), who smoked an average of 4.5 (1.3) cigarettes per day, had 5 laboratory sessions after overnight abstinence verified by breath CO. In each session, participants first sampled and rated the subjective effects an IV dose of nicotine (0.0125, 0.025, 0.05, 0.1, or 0.2 mg/70kg) versus saline (placebo). After the sampling period, participants were given a total of 10 opportunities to choose between the IV dose of nicotine or placebo using a choice procedure. **Results:** Analysis of the subjective drug effects from the sampling period using mixed effects revealed a significant effect of nicotine dose for "stimulatory" ($p<0.001$) and "pleasurable" ($p<0.001$) effects, but not "aversive" effects. Post hoc comparisons showed that the placebo and the lower nicotine doses (0.0125 and 0.025 mg) produced lower "stimulatory" and "pleasurable" effects than higher doses (0.1 and 0.2 mg). The choice outcome, measured by the percent of times that nicotine dose was chosen vs. saline out of 10 possibilities, was also analyzed using mixed effects models. Results were compared with a confidence interval (CI) to the expected percent corresponding to no preference (i.e., 50%). There was a significant effect of nicotine dose ($p=0.004$) with only the highest dose (i.e., 0.2 mg) consistently preferred to placebo (least square mean=67%, 95% CI: 58%, 77%). **Conclusion:** Taken together, the threshold for detecting



positive effects of nicotine in young adult smokers is about 0.1 mg, but a higher dose of nicotine, 0.2 mg, is required to produce a sufficient nicotine reinforcement. These nicotine doses are within the range delivered by inhaling a puff of a cigarette. Findings support the utility of our model to determine the threshold for the positive subjective and reinforcing effects of nicotine.

FUNDING: Unfunded; Federal

C-33

COMPARING USERS' AND VAPING PRODUCT CHARACTERISTICS, PATTERNS OF PRODUCT USE, PUFFING TOPOGRAPHY, AND NICOTINE EXPOSURE BETWEEN POD AND MOD ENDS USERS

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Significance: The proliferation of pod-style ENDS is a relatively recent trend in the ENDS market. Pod-style ENDS differ from other devices (e.g., mods) primarily due to the use of nicotine salts rather than freebase nicotine - a different nicotine formulation that can affect palatability and nicotine absorption. Our objective was to compare mod and pod ENDS users on ENDS features, use behaviors, and nicotine exposure. **Methods:** Data are from the initial visit of 57 ENDS users (28 mod, 29 pod) enrolled in a larger cohort study. Participants self-reported demographics, cigarette/ENDS use history, and daily use patterns. Samples of ENDS liquids were collected and tested for nicotine, propylene glycol (PG)/vegetable glycerin (VG) ratio, and salts using GC-MS. Puffing topography was captured using a CReSS Micro during an *ad lib* puffing bout. Participants also provided spot urine samples that were analyzed for cotinine and NNAL using LC-MS/MS. **Results:** Pod and mod users did not differ on demographic characteristics or cigarette use history. No participants reported current daily smoking, and none had NNAL levels indicative of cigarette smoking. Mod users self-reported using their ENDS for longer (58.9±5.0 vs 35.3±4.4 months, $p=.001$) and purchasing more liquid in the past month (113.2±19.0 vs 42.1±8.3 ml, $p=.001$). Mod liquids contained lower concentrations of nicotine (7.1±1.7 vs 39.0±3.5 mg/ml, $p<.001$), lower PG/higher VG ratio ($p<.05$), and fewer had salts present (10.7% vs 48.3%, $p<.01$) than pod liquids. Mod and pod users did not differ on puff topography outcomes. Urinary cotinine levels also did not differ between mod and pod users (1,282.3±145.6 vs 1,291.7±173.3 ng/ml, respectively, $p>.05$). **Conclusion:** Pod and mods users share similar demographic characteristics, smoking history and appear to puff on their ENDS devices in a similar way. Although pod users use ENDS solutions with significantly higher nicotine concentrations, they also use lower quantities of the products. Despite using highly-concentrated nicotine solutions, pod users appear to be exposed to similar doses of nicotine as mod users.

FUNDING: Federal

C-34

PSILOCYBIN-FACILITATED SMOKING CESSATION -COMPARATIVE EFFICACY VS. NICOTINE PATCH

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Significance: We conducted an open-label pilot study testing psilocybin in combination with manualized cognitive behavioral therapy (CBT) in 15 treatment-resistant smokers. Data showed no serious adverse events attributable to psilocybin, and a very promising cotinine-verified point-prevalence abstinence rate of 80% at 6-month follow-up. A 2.5-year follow-up showed a cotinine-verified abstinence rate of 60%. **Methods:** We are currently conducting a comparative efficacy trial randomizing treatment-resistant smokers to a single psilocybin session (on their target quit date) or the transdermal nicotine patch (using FDA guidelines, beginning 24 hours after their target quit date), both in combination with a 13 week program of manualized CBT. **Results:** We report data for the 44 participants who have completed their 12 month follow up (22 per group). Interim results show substantially higher cotinine-verified 7-day point-prevalence abstinence rates at 12-months with psilocybin (59%) vs. nicotine patch (27%). Continuous abstinence data also show substantially higher 12-month abstinence rates for psilocybin (36%) vs. nicotine patch (9%). Continuous abstinence rates show relatively little decline over time with psilocybin (42% at 3 months and 36% at 12 months) compared to nicotine patch (29% at 3 months and 9% at 12 months). Nicotine patch point-prevalence data show typical decline over time (43% at 3 months and 27% at 12 months), while point-prevalence abstinence increases slightly over time with psilocybin (54% at 3 months and 59% at 12 months). **Conclusions:** Interim smoking cessation efficacy analyses suggest promising results for psilocybin in comparison to transdermal nicotine patch

when both are delivered in combination with CBT. Similar to results with psilocybin in treating cancer-related depression and anxiety, psilocybin results for smoking cessation may be notable for their sustainability over time. **Acknowledgements:** Funding provided by Heffter Research Institute and Beckley Foundation.

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C-35

CORRELATES OF THE NICOTINE METABOLITE RATIO IN ALASKA NATIVE PEOPLE WHO SMOKE

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Significance: Research on nicotine metabolism has primarily focused on White adults. This study examined associations between nicotine metabolism, tobacco use, and demographic characteristics among Alaska Native adults who smoke. **Methods:** Participants (N=244) were Alaska Native adult smokers who provided a plasma sample at baseline (70.1%) or follow-up (29.9%) of a randomized controlled trial of a cardiovascular risk behavior intervention. At baseline, participants self-reported age, sex, Alaska Native heritage, cigarettes per day, time to first cigarette upon waking, menthol use, perceived difficulty staying quit, tobacco withdrawal symptoms, and past-month tobacco product use, binge drinking, and cannabis use. At 3, 6, 12, and 18-month follow-ups, participants self-reported seven-day point prevalence abstinence from smoking. Height and weight were measured to calculate body mass index (BMI). Participants' nicotine metabolite ratio (NMR), calculated as the ratio of plasma cotinine and *trans*-3' hydroxycotinine, was log-transformed. **Results:** The sample (52.0% male, M age=47.0 [SD=13.8], 60.3% of Inupiaq heritage) averaged 12.5 cigarettes per day (SD=10.5); 64.0% smoked within 30 minutes of waking. NMR was not significantly associated with participant age, sex, Alaska Native heritage, BMI, cigarettes per day, time to first cigarette upon waking, menthol use, perceived difficulty staying quit, past-month dual tobacco product use, withdrawal symptoms, past-month binge drinking, past-month cannabis use, or abstinence from smoking (all p -values > 0.050). **Conclusions:** Alaska Native adults typically smoke fewer cigarettes per day and may smoke for different rewards than White adults. Unlike White smokers, Alaska Native adult smokers with slower nicotine metabolism appear not to titrate their nicotine intake.

FUNDING: Federal; State

C-36

IMPACT OF SUPPORTIVE MUSIC ON SUBJECTIVE AND THERAPEUTIC EFFECTS IN PSILOCYBIN ASSISTED SMOKING CESSATION

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Significance: A growing body of evidence supports the 5HT_{2A} agonist psilocybin as a useful therapeutic for smoking cessation. Little research has evaluated how variations in intervention delivery impact subjective and therapeutic effects. This analysis evaluates effects of music type, classical (typically used in psychedelic studies) versus overtone-heavy instruments (e.g. gongs), on session experience and smoking cessation outcomes among nicotine-dependent smokers in an open-label study. **Methods:** Participants (N=10) received a moderate (20 mg/70kg) psilocybin dose in Session 1, which served as a target-quit date. Two weeks later, participants received a high (30 mg/70 kg) psilocybin dose in Session 2. Music type accompanying sessions was counterbalanced. Participants also selected a preferred music type for a third psilocybin session involving the high dose. Biologically confirmed smoking abstinence was determined by exhaled carbon dioxide, urinary cotinine, and participant self-report. **Results:** Higher mystical experiences (MEQ30 scores) were observed for overtone (mean=0.68) compared to classical sessions (mean=0.52) at a medium effect size ($d_z=0.57$), although was not statistical significance, $p=.11$. Music choice for the third session was roughly equally distributed with 60% of participants selecting overtones. Half of participants (2/4) who selected classical music were abstinent at the end of treatment (i.e., 8-weeks following target quit date) and remained abstinent through the remainder of assessments (up to ~30-month follow-up). The majority (5/6; 83.3%) of participants who selected overtone music were abstinent at the end of treatment. Most of these participants (4/6; 66.6%) remained abstinent through follow-up. **Conclusion:** These data suggest similar benefits, if not favoring overtones, for smoking cessation based on the supportive music in psilocybin sessions, calling into question whether classical music typically played in



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psychedelic session hold special importance. More broadly, these findings emphasize the need for parametric examination of session components to optimize and individualize therapeutic effects of psilocybin-assisted psychotherapy.

FUNDING: Federal; Nonprofit grant funding entity

C-37

THE EFFECT OF ELECTRICAL POWER ON NICOTINE DELIVERY, TOXICANT EXPOSURE, AND VAPING BEHAVIOR AMONG EXPERIENCED E-CIGARETTE USERS

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Objective: We examined changes in nicotine exposure, subjective effects, vaping behavior, and toxicant exposure during a standardized session and 90-min and 12-h ad libitum access at different power levels of an e-cigarette. **Methods:** Adult experienced e-cigarette users took part in three arms of a crossover study; each arm comprised of two consecutive days. The first day of each arm included a session of ten 4-s puffs followed by 4 h of abstinence then 90 min of ad lib access. The second day included 12 hours of ad lib access to the e-cigarette from 8AM to 8PM. Blood was sampled, and questionnaires were administered at each session. Participants used a Joytech tank (1.5-Ohm coil) powered to 10, 15, and 20 W by a Lost Vape Paranormal DNA 250C (monitors puff count and duration in real-time), and Mardi Gras e-liquid (12 mg/mL). **Results:** The results presented are based on 8 participants who have completed the study to date (7 M, 1 F). During the 10-puff session, the average amount of nicotine inhaled increased with power (1.1±0.4, 2.1±0.8, and 2.8±1.2 mg) (all data are presented for 10, 15, and 20 W, in this order). During the 90-min ad lib session, the average number of puffs did not differ across power levels (44.8±29.7, 38.4±22.4, and 44.3±26.5) but puff duration decreased (4.6±1.5, 3.6±1.5, and 2.6±1.1 s) and the amount of nicotine inhaled increased with power (4.7±3.8, 6.3±4.9, and 7.5±5.0 mg). Similarly, during the 12-h ad lib session, the number of puffs remained flat (120±69, 123±79, and 130±65 puffs) but puff duration decreased (4.9±1.9, 3.6±1.7, and 3.0±1.4 s) and amount of nicotine inhaled increased with power (13.6±9.8, 18.0±12.0, and 22.9±12.6 mg). Satisfaction, relieve craving, liking, sweetness, desire to use again tended to be higher at 15 W while feelings of nausea, strong throat hit, harshness, and dizziness were higher at 20 W. Additional data will include blood nicotine and biomarkers of volatile organic compounds, as well as data from more participants. **Conclusion:** While vaping topography and nicotine intake change with power, vaping pattern remains fixed in experienced users. Further, subjective effects change with power but in a nonlinear manner.

FUNDING: Federal

C-38

6-MO TOBACCO USAGE AMONG CANCER PATIENTS ENGAGED IN A TOBACCO TREATMENT PROGRAM- LEARNINGS TO IMPROVE ENGAGEMENT

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Background. Tobacco is the leading cause of cancer and cancer-related deaths. With an NCI P30 Moonshot Supplement, the Stanford Cancer Center integrated tobacco cessation treatment into 16 cancer care clinics as a covered benefit. We report on quit status at 6 months follow-up among patients engaged in tobacco treatment. **Sample.** Of 29,450 patients treated at the clinics January 22, 2019 to July 24, 2020, 29,151 (99%) were screened for tobacco use, and 1,543 (5%) were identified as current tobacco users; 1,186 (77%) tobacco users were reached; of whom, 326 (27%) engaged in tobacco cessation treatment. Among the 326 patients engaged in tobacco treatment, 122 (37%) opted for counseling and 299 (92%) for medications; 89 (27%) selected both. Counseling and medication consults were offered via telemedicine at no charge to patients and with medication free home delivery, both prior to and during the COVID-19 pandemic. The current analysis focuses on the 161 patients due for 6-months follow-up. **Methods.** Quit status, defined as no current tobacco use, was obtained through a brief online, mail, or phone survey, or by chart review as needed. Cotinine confirmations by mail were halted due to COVID-19 concerns. Five-point Likert scales assessed treatment satisfaction and the likelihood of referring the program to others. **Results.** To date, 120 of 161 (75%) 6-month outcomes were obtained: 70 (58%) by phone, 36 (30%) by chart review, and 14 (12%) online/mail. Of the 120 patients, 32 (27%) of reached, 20% of those due) reported no tobacco use at 6-months, with one using e-cigarettes. Quit rates

were similar for men (26%) and women (27%). At 6-months follow-up, 69% reported satisfaction with the program, 24% were neutral; and 73% would refer the program to others. **Discussion.** Follow-up at 6-months exceeds the CDC's level of adequate retention (>70%), with quit rate comparable to other cancer center programs, which tend to be about 20%. Ongoing efforts for engagement and program expansion include partnering with interpreter services, creating a more efficient workflow in the electronic health record, and adding outlying clinics.

FUNDING: Federal

C-39

THE FEASIBILITY OF TWO PROMISING METHODS TO SUPPORT SMOKING CESSATION AMONG QUITLINE CALLERS

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Significance: Delay discounting (DD), the propensity to devalue delayed rewards, is a promising new therapeutic target for smoking cessation. Episodic Future Thinking (EFT) and Future Thinking Priming (FTP) can reduce DD rates and cigarette consumption in controlled settings. We examined the feasibility of remote administration of EFT and FTP among New York State Smokers Quitline (NYSSQL) callers. Study participation was examined pre and post April 4, 2020, when NYS became the epicenter of the COVID pandemic. **Methods:** This factorial design (2x2) included two factors (EFT, FTP) each with two levels, active (A) and control (C). Smokers were recruited Jan 16 to Feb 17, 2020 and randomly assigned to one of 4 conditions (AA, AC, CA, CC). EFT and FTP tasks were administered on alternating weeks for 12 wks. Number of cigarettes per day (CPD) was collected bi-weekly. **Results:** Participants (n=20) were 65% women and 50% White, mean age 55 (SD=10.6) yrs; 70% were unemployed. The mean FTND score was 4.8 (SD=2.3); mean CPD was 15.2 (SD=8.6). Two participants completed no tasks and were withdrawn. Participants (n=18) completed 58% of the tasks. No differences were found in the proportion of tasks completed across the 4 conditions ($F(3,16)=.55, p=.66$) and between A and C tasks (62.5% vs 56.9%, $\chi^2(1, N = 240)=.74, p=.42$). The mean number of days abstinent was 19 (SD=27.9). More days abstinent were found during weeks that the FTP A tasks vs the FTP C tasks were completed (Mean=3.6 (SD=3.4) vs Mean=.93 (SD=1.8) $t(69) = 3.83, p<.001$). FTP A showed the most promising reductions in DD rates. The proportion of tasks completed pre-April 4 was significantly greater than the proportion of tasks completed post-April 4 (69.0% vs 47.7%; $\chi^2(1, N = 240) = 11.146, p < .001$). **Conclusions:** Findings suggest that a larger study to examine potential efficacy to support cessation is feasible. Recruitment was robust and a reasonable proportion of A and C tasks were completed despite COVID.

FUNDING: Unfunded

C-40

COMPARING VIDEO OBSERVATION TO ELECTRONIC TOPOGRAPHY DEVICE AS A METHOD FOR MEASURING CIGARETTE PUFFING BEHAVIOR

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Significance: Smoking topography, or puffing behavior, is an important measure of how consumers may use tobacco products. However, numerous issues (e.g., financial, pandemic) may prevent collection of this data via in-person, electronic topography device. This study compared topography measures collected by video observation and electronic device. **Methods:** Laboratory smoking sessions were video recorded and scored for 96 cigarettes collected from 34 daily, adult non-treatment-seeking smokers (73.5% male, 82.4% White) participating in the baseline period of a larger trial. Participants smoked three of their preferred brand cigarettes using an electronic topography device, providing carbon monoxide (CO) samples before and after each cigarette. Analyses compared measures from both assessment methods and examined their associations with device-obtained total volume and CO boost. **Results:** Agreement analyses indicated robust similarity between methods for measures of puff count and total inter-puff interval (Intraclass Correlation Coefficient [ICC]'s > 0.96, p 's < 0.001; Bland-Altman [B-A] plotted differences within *a priori* limit of clinical significance) but diverged on total duration (ICC's > .93, p 's < .001, yet B-A plots outside limit of clinical significance). Despite divergence in total duration, all measures were similarly associated with total volume and CO regardless of assessment method. **Conclusions:** Topography measures obtained from



video observation are generally interchangeable with their topography device-obtained counterparts. Video-observed topography measures predicted behavior (total volume) and acute exposure (CO boost) as well as the electronic topography device. As such, video observation is likely a sufficient substitute method for assessing topography when using an electronic device is not possible.

FUNDING: Federal

C-41

ACUTE EFFECTS OF MENTHOL CIGARETTE USE ON HUMAN COGNITIVE TASK PERFORMANCE

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Significance: Although menthol has been shown to target similar brain regions and neural receptors as nicotine, no studies to date have examined the association between menthol cigarette use and human cognitive enhancement. The current study assessed whether acute menthol, compared to non-menthol, cigarette smoking is associated with increased performance on cognitive and reward processing tasks. **Methods:** 30 menthol (MS) and 30 non-menthol (NMS) White and African American (AA) cigarette smokers (50% female, 72% White, age M=43.8, 14.9±6 cigarettes/day) completed four computerized tasks before and after smoking their preferred cigarette: Continuous Performance Task (CPT; alerting attention), N-Back Task (working memory), Finger Tapping Task (motor control), and Apple Picker Task (reward processing). Repeated measure ANCOVAs were used to examine differences between MS and NMS groups on changes in computerized task performance. Exploratory analyses also examined potential racial differences (White vs. AA) among MS for each task. **Results:** Uncontrolled analyses found a significant difference in the change in CPT speed after smoking by cigarette type group ($F(1,56)=4.33, p=.04$), where MS improved after smoking while NMS worsened. There were also significant between-subject effects in overall cognitive task performance by cigarette type, where MS had decreased accuracy on the CPT and N-Back Task and increased speed during the N-Back task compared to NMS ($p's < .05$). However, after controlling for baseline cigarette craving and nicotine levels, there was no difference between groups on any performance tasks. Exploratory analyses on racial differences among MS found differences in CPT accuracy ($F(1,26)=4.66, p=.04$), where White smokers had greater increase in accuracy compared to AA smokers. **Conclusion:** Study results provide preliminary evidence that menthol cigarette use may have acute cognitive effects, particularly on alerting attention, among current cigarette smokers, and that effects may differ by race. Further research is needed to clarify influences from chronic use as well as potential racial differences.

FUNDING: Academic Institution; Nonprofit grant funding entity

C-42

EFFECTS OF FLAVORED TOBACCO ON BLUNT ROLLING BEHAVIOR AND CANNABIS EXPECTANCIES

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Significance: Use of blunts, cigars wrapped with cannabis, has become common in the United States, with the highest use rates among racial/ethnic minorities and adolescents/young adults. Frequency of blunt use has been associated with higher levels of problematic cannabis use and nicotine dependence. Blunts are often prepared with flavored cigar wrappers, which may increase their appeal by masking the harshness and taste of tobacco and cannabis. Though blunt use is highly prevalent, no prior studies have examined preparation of cannabis blunts in a clinical setting. The purpose of this pilot study was to examine how a) regular users prepare cannabis blunts, and b) the effects of flavored tobacco wrappers on preparation and drug effect expectancy. **Methods:** Adult regular blunt users (N=8) were instructed to prepare blunts per their usual method using loose cannabis (NIDA drug supply) and 3 types of cigarillo flavor (unflavored, grape, and chocolate) in a randomized order. After preparation, participants rated subjective rolling and use expectancy effects using a 20-item self-report questionnaire. **Results:** Most participants were male (7/8), African American (7/8), 18-34 years old (6/8), and used flavored cigars/cigarillos for blunts previously (7/8). Participants prepared blunts by ripping the cigarillo wrapper lengthwise, emptying all of the filler tobacco, and re-rolling with approximately 0.7 (SD ± 0.2) grams of cannabis. The amount of cigar tobacco retained and the weight of cannabis added did not differ as a function of blunt flavor, but participants reported higher ratings of "want to smoke blunt" and "think blunt will get you high" for chocolate-flavored blunts than for unflavored blunts ($p < 0.05$). **Conclusions:**

These data suggest that while flavor of cigarillo wrappers may not influence rolling behavior, they may increase abuse liability-related subjective drug effect expectancy. Relations between tobacco flavoring, blunt smoking behavior, abuse liability related subjective drug effects, and toxicant exposure have implications for tobacco control policy and should be examined further in future clinical laboratory studies.

FUNDING: Nonprofit grant funding entity

C-43

PLASMA NICOTINE DELIVERY AND PUFF TOPOGRAPHY 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 nicotine can be protonated (salt), potentially making the aerosol easier to inhale than freebase nicotine. This study's purpose is to determine, in ECIG users and cigarette smokers, the effects of 3 concentrations of protonated nicotine aerosolized at 2 different power settings (in watts). **Methods:** Twenty-two participants (13 men, 8 women, 1 other; 16 white; 12 cigarette smokers, 10 ECIG users) with a mean age of 29 (SD=8.2) 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 and then used each product for 60 minutes, *ad lib*. Plasma nicotine concentration and puff topography were measured. **Results:** A pattern of increased plasma nicotine concentration as protonated nicotine concentration and device power increased was observed, with significant interactions of concentration by time and power by time ($ps < .05$), and significant increases in plasma nicotine across all conditions after product use. The largest plasma nicotine increases occurred in the conditions with higher power and greater nicotine concentrations, with 18.3 (19.2) ng/ml in the 30 mg/ml+30 W condition compared to 8.7 (7.7) ng/ml in the 10 mg/ml+15 W condition, after 10 puffs ($p < .05$). For puff duration, a significant interaction of concentration by power was observed ($p < .05$), with puff duration decreasing as concentration and power increased, and with the shortest puffs in the 30 mg/ml+30 W condition. Overall, smokers took shorter puffs than ECIG users ($p < .01$). **Conclusion:** Data on the plasma nicotine delivery and puff topography of acute protonated nicotine product use is limited. These results suggest that protonated nicotine delivery is influenced by nicotine concentration in the liquid and device power, and that puffing behavior changes along with device and liquid characteristics. These findings can inform future product regulations, such as limits on nicotine flux (nicotine emitted per unit time). **Supported by:** NIDA of the NIH under Award Number U54DA036105 and the CTP of the U.S. FDA.

FUNDING: Federal

C-44

EFFECT OF MARIJUANA USE ON SMOKERS SWITCHING TO E-CIGARETTES IN A RANDOMIZED CONTROLLED TRIAL

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Significance: Co-use of tobacco and marijuana is common, and research suggests that marijuana use may be a barrier to smoking cessation. Research to date has not evaluated how marijuana use affects switching from cigarettes to e-cigarettes (e-cigs) and related outcomes. **Methods:** This secondary analysis includes adult smokers randomized to the e-cig group (N=114; 52% African American; 48% Latinx) in a study conducted in Kansas City, MO and San Diego, CA from 2018-2019. Participants were provided JUUL e-cigs and asked to switch exclusively for 6 weeks. Past 7-day tobacco and marijuana use, carbon monoxide (CO), and respiratory symptoms were measured at baseline, week 2, and week 6. Multiple linear regression models were used to evaluate the contribution of marijuana use to cigarettes smoked, CO, and respiratory symptoms at week 6. **Results:** At baseline, 40% percent of the sample reported co-use of tobacco and marijuana, measured as any use of tobacco and marijuana in the past 7 days. Baseline cigarettes smoked predicted cigarettes smoked at week 6 ($R^2 = .13$) and adding the variable of any marijuana use during the study did not improve model fit ($\Delta R^2 = .00$). Marijuana use at week 6 improved model fit for CO at week 6 ($\Delta R^2 = .06$), beyond what cigarette smoking explained; marijuana use was associated with a 4.2 parts per million increase in week 6 CO compared to no use of marijuana,



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after controlling for week 6 cigarettes smoked. Respiratory symptoms at week 6 were explained by baseline respiratory symptoms, cigarettes smoked at baseline, age, and marital status ($R^2 = .37$) and marijuana use during the study did not improve model fit ($\Delta R^2 = .01$). **Conclusions:** Marijuana co-use was not a barrier to switching to e-cigs in a 6-week trial and use did not contribute to respiratory symptoms beyond other risk factors. Marijuana use uniquely contributed to elevated CO beyond cigarette smoking. This creates an increased risk of adverse cardiopulmonary outcomes and may be a confounding factor when using CO as an endpoint to bio-verify exclusive e-cig use. Inclusion of marijuana co-users in future research may benefit from using CO cut-points which account for combustible marijuana use.

FUNDING: Federal

C-45

DECIDETEXTO: EFFECTS OF ACCULTURATION ON BIOPSYCHOSOCIAL CHARACTERISTICS AND SMOKING PATTERNS AMONG U.S. LATINOS IN A MOBILE CESSATION INTERVENTION

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INTRODUCTION: The biopsychosocial model of addiction conceptualizes tobacco use as being, in part, driven by key sociological constructs. While smoking patterns vary across racial and ethnic groups, little research has examined variation within groups. **OBJECTIVE:** To assess whether biopsychosocial characteristics and smoking behaviors differ by level of acculturation in a diverse U.S. sample of Latinos. **METHODS:** The sample (n=436) consists of baseline data from an ongoing clinical trial assessing an m-health smoking cessation intervention for Latinos. Participants in the United States who originated from 20 Latin American countries were enrolled. Baseline data included smoking patterns (cigarettes per day (CPD), nicotine dependence, and use of menthol cigarettes, pharmacotherapy and e-cigarettes), and years in the U.S. and language (proxies for acculturation). **RESULTS:** Participants' mean age was 48.7 years (SD 11.1) and over half (54.6%) were men. Most participants (71.1%) spoke Spanish as their preferred language and were daily smokers (93.1%). English speaking Latinos used significantly more menthol cigarettes (63.5% vs 41.6%; $p < 0.001$), more e-cigarettes in the past to quit smoking (58.7% vs 38.7%; $p < 0.001$), and less cessation pharmacotherapy (54.0% vs 66.6%; $p = 0.016$) compared to Spanish speaking smokers. English-speaking participants smoked at similar rates (CPD mean=12.1 vs 11.9; $p = 0.839$) and had similarly high rates of nicotine dependence (73.8% vs 69.7%; $p = 0.417$) compared to Spanish-speaking participants. Those who primarily spoke English had significantly higher rates of anxiety (M=2.1 vs 1.5; $p = 0.002$), higher CO levels (M=17.5 vs 14.5; $p = 0.029$), and more comorbidities (mean=1.9 vs 1.5; $p = 0.034$). There were no associations between number of years in the US and smoking and psychosocial characteristics. **CONCLUSION:** Compared to Spanish speaking smokers, English speaking Latino smokers had poorer health and more problematic smoking behaviors. Results show that differences in smoking patterns by language should be taken in consideration to further improve treatment outcomes among Latinos.

FUNDING: Federal

C-46

A REVIEW OF SOCIAL DETERMINANTS OF HEALTH QUESTIONS FOR USE IN CLINICAL TRIALS IN TOBACCO USERS

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Significance. Disparities in smoking behaviors and tobacco-related harms to health persist among adults in the U.S. A higher proportion of adult cigarette smokers have lower educational attainment and live below the federal poverty level compared with non-smokers. The disproportionate impact to health from tobacco use is influenced, in part, by social determinants of health (SDoH). Limited evidence exists on how SDoH influence enrollment, retention and how they may be associated with tobacco product use behaviors among adults in clinical trials of tobacco. Here we describe the selection of items included on a SDoH assessment developed for use in clinical trials including adult smokers. **Methods.** Questions were adapted from the Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PRAPARE) and the Adverse Childhood Experiences (ACEs) surveys. They were selected due to the alignment with

recommendations for the inclusion of SDoH measures from the National Academies of Sciences, Engineering and Medicine. Measures considered for inclusion were questions related to housing stability (worried about losing housing), household size, material security (e.g., food, clothing, utilities, child care, medicine or any medical care), transportation, adverse childhood experience, social connection, and neighborhood safety. Other measures routinely collected in clinical trials (e.g., race, ethnicity, education, employment, health insurance, income, and mental health/stress) were also included. Questions chosen for inclusion in the final survey were categorized within the five Healthy People 2020 domains: a) economic stability; b) education and early childhood development; c) social and community context; d) health and health care; and e) neighborhood and built environment. **Results.** A comprehensive assessment of SDoH-related risk included 17 questions, 5 of which are items typically included as standard baseline questions in tobacco clinical trials. These items provide a score between 0 and 17 for measures within the five SDoH domains. **Conclusion.** A comprehensive assessment of SDoH-related risk should be considered in future clinical trials of tobacco users, and can be achieved without excessively lengthy questionnaires.

FUNDING: Federal

C-47

ASSOCIATION BETWEEN TOBACCO PRODUCT USE AND ASTHMA AMONG US ADULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Background Research on cigarettes and adult asthma offers mixed findings, perhaps due to presence of COPD and inadequate adjustment for smoking history and other smoke exposures. Associations between other tobacco products, including e-cigarettes and asthma are understudied. **Research Question** Using the PATH Waves 2-4 (2014/15 to 2016/17), we assessed the relation between tobacco product use and asthma in persons unlikely to have chronic obstructive pulmonary disease (COPD). **Study Design and Methods** Prospective study of 10,267 adults ages 18-39y without COPD. Past month tobacco use at Wave 2 was modeled first as combustible vs noncombustible use and second as specific product categories (any use of cigarettes, e-cigarettes, cigars, hookah, and/or smokeless tobacco). Outcomes included lifetime asthma prevalence, incidence (Waves 3&4), and symptom severity (Asthma Control Test [ACT]; lower score=worse). Multivariable regressions adjusted for predictors of asthma, including other smoke exposures: cigarette pack-years, secondhand smoke, and marijuana use. Sensitivity analyses examined how adding persons > 39y and those with both COPD and asthma, and also not adjusting for other smoke exposures affected findings. **Results** Only cigar use was associated with lifetime asthma prevalence, and no product was associated with incidence. Among asthmatics at Wave 2, combustible tobacco use (beta=-0.86, 95% CI [-1.32, -0.39]) and cigarette use (beta=-1.14, 95% CI [-1.66, -0.62]) were associated with lower mean ACT scores. No tobacco product was associated with change in ACT over time. In sensitivity analyses, tobacco use was associated with asthma when adults 39+ years and persons with asthma+COPD were included, and adjustments for other smoke exposures were omitted. **Interpretation** Although baseline cigar use was associated with asthma, and cigarette use with worse asthma control, there was no longitudinal association between tobacco use and new onset or worsening asthma in these preliminary analyses. Research on the impacts of tobacco on asthma should be careful to exclude COPD and adjust for smoking history and other smoke exposures.

FUNDING: Federal

C-48

A QUALITATIVE EVALUATION OF IQOS PACKAGING AND FLAVOR FOLLOWING PRODUCT SAMPLING

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Significance: IQOS (I Quit Ordinary Smoking) is a heated tobacco product that is gaining popularity in the USA since the FDA approval its sale. With the more recent modified risk tobacco product approval for modified exposure claims, it is pivotal to understand the role of packaging features and flavor in appeal and use of along with switching to the



product. Methods: In-depth cognitive interviews were conducted with current cigarette smokers (n=25) after viewing and opening the IQOS device packaging, sampling a tobacco heatstick, and sampling a smooth menthol heat stick. Interviews were audio-recorded, transcribed, and coded by 2 independent coders. Themes were identified using inductive and deductive techniques. Results: Participants were 45% female, 45% Black, 11% Hispanic, and a mean of 44 years old. Participants smoked, on average, 11 cigarettes per day, with median FTND score of 6.4 and median carbon monoxide level of 18.4 ppm. Overarching themes were packaging, flavor, and health risks. All participants indicated that they would like to open and try the product after viewing the packaging and a majority indicated that the packaging was appealing and resembled cell phone packaging. Most participants found one of the flavor options satisfying, usually their cigarette flavor preference, though multiple participants did describe both tobacco and smooth menthol flavor options as satisfying. Most participants indicated that they would try other flavor options, with fruit being mentioned most. Regarding health perceptions, most participants didn't think the IQOS was harmful or had concerns about use. When asked about relative harm, most indicated that they did not believe IQOS was more harmful than cigarettes and many thought the level of harm was the same between the two products. Conclusions: The qualitative results suggest that the IQOS device is appealing and satisfying to current smokers who do not believe the harm in using is greater than using cigarettes. These perceptions indicate that IQOS may be suitable as a cigarette smoking cessation aid should it be effective.

FUNDING: Federal

C-49

THE EFFECTS OF SMOKING CESSATION ON INSULA-BASED CONNECTIVITY

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Significance: The insula is believed to connect the interoceptive awareness of tobacco craving or withdrawal with a larger brain network that enacts the decision to smoke or to not smoke. However, the role of the insula in smoking cessation is poorly understood. Previously, we reported stronger resting-state functional connectivity (RSFC) between the insula and the bilateral pre- and post-central gyri among smokers who remained abstinent, compared to those who relapsed, during a 10-week quit attempt. Here, we compared current smokers to ex-smokers (at least 2 years abstinent). Methods: Current smokers (n = 26) and ex-smokers (n = 16) underwent a resting-state functional magnetic resonance imaging scan. The bilateral insula, as well as bilateral insula subdivisions (posterior, ventroanterior, and dorsoanterior) were used as seed regions of interest in a seed-to-voxel connectivity analysis. RSFC with the bilateral insula was also correlated with measures of tobacco use severity and dependence across all subjects. Results: Smokers had greater RSFC than ex-smokers between the insula and the bilateral posterior parietal cortex. Follow-up analyses revealed that smokers also had greater RSFC between the posterior insula and the bilateral thalamus/caudate, as well as between the ventral insula and the left frontal pole. Tobacco use severity negatively correlated with RSFC to the ventromedial prefrontal cortex, tobacco dependence negatively correlated with RSFC to the bilateral putamen. Conclusions: Unexpectedly, smokers had stronger insula-based connectivity than ex-smokers with brain regions implicated in executive control, attention, and somatosensory processing. Smokers (present) and ex-smokers (past) tobacco use severity and dependence scores were negatively associated with connectivity to brain regions implicated in emotional regulation and somatosensory processing. This suggests that differences in insula-based RSFC may be a cause or consequence of smoking status, but that trait-like individual differences in severity and dependence persist after smoking cessation.

FUNDING: Federal

C-50

IMPACT OF THE IMMINENT POSSIBILITY OF SMOKING AND WITHDRAWAL SYMPTOMS ON BRAIN RESPONSES TO SMOKING-RELATED CUES

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Smoking relapse is often precipitated by exposure to smoking-related cues. Functional magnetic resonance imaging (fMRI) studies have shown that smokers have larger brain responses to smoking cues than to neutral cues, suggesting that smoking cues are motivationally significant. Prior fMRI research has only addressed smokers' responses to cues when smoking was not imminently possible. The goal of this study was to deter-

mine how brain responses to cues change when smoking is imminently possible inside the scanner, a condition that more closely resembles relapse. 24-h nicotine-deprived smokers (N=43) completed a single fMRI scanning session while they viewed a series of smoking-related and neutral pictures, each surrounded by a colored frame indicating whether smoking was possible inside the scanner on any given trial. Immediately after one of the smoking-possible trials, participants smoked a cigarette inside the scanner through an MRI-compatible smoking device. Data were analyzed using ANOVA with picture category (smoking-related, neutral), smoking possibility (possible, not possible), and block (before or after smoking) as factors. There was a significant main effect of picture category in several occipital and posterior parietal brain regions ($p < .05$), consistent with prior cue reactivity research. There were no significant main effects of smoking possibility, but there was a significant smoking possibility x stimulus category interaction in the inferior frontal gyrus: brain responses to smoking cues were greatest on trials where smoking was possible ($p < .05$). Additional analyses found significant interactions between pre-scan questionnaire scores, smoking possibility, and block. After smoking in the scanner, participants who had reported more pre-scan withdrawal symptoms had greater BOLD responses on smoking possible trials than on smoking not possible trials in several brain regions, including the inferior occipital lobe and basal ganglia. This suggests that the motivational significance of smoking cues may be affected by transient changes in cigarette availability, especially when accompanied by withdrawal symptoms.

FUNDING: Federal

C-51

COVID AND SMOKING AT UNIVERSITY OF MARYLAND

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Background: University of Maryland Epic electronic health record has two-way communication with the Maryland Tobacco Quitline and utilizes a Clinical Decision Support system. **Methods:** Data collected since January 2018 - December 2019 yielded 1790 individuals who have been referred to the Maryland Quitline utilizing electronic referrals. We explored frequency of acceptance of tobacco cessation services by demographics, co-morbidities, insurance type and neighborhood deprivation using the Area Deprivation Index (ADI). Associations between groups of comparison were assessed using Chi-square test with significance level established at $\alpha=0.05$. **Results:** Sixty percent of referred individuals lived in areas with high neighborhood deprivation, measured with Maryland ADI (ranks 8-10), 82% are African Americans. Overall, 322 of patients (18%) accepted Quitline services. The acceptance rate was highest among younger (<25 years old) and older (65+ years old) patients compared to other age groups (23% versus 16-18%, $p=0.0136$), and was higher in females compared to males (20% versus 15%, $p=0.0004$). Among African Americans, 24% accepted Quitline services compared to 10-13% of other races ($p<0.0001$). Hypertension, Diabetes, HIV and Schizophrenia diagnoses were positively associated with Quitline service acceptance. In contrast, patients with history of drug abuse had lower acceptance rate compared to other patients (10% versus 18%, $p=0.0208$). Quitline service acceptance rate was highest in individuals with Medicare (24%, $p=0.0001$). Quitline service acceptance rate was significantly higher in ADI (ranks 8-10) compared to ADI (ranks 1-7) (23% versus 9-13%, $p<0.0001$). **Conclusion:** The use of electronic referrals and two-way communication with the Maryland Quitline has provided a solution to reaching individuals with tobacco dependence in the most vulnerable demographic groups: youth and patients age 65+, those with hypertension, diabetes and schizophrenia. In addition, the referral process was successful in providing a 'free' telephone resource for tobacco cessation to Medicare beneficiaries and those living in the most deprived neighborhoods.

FUNDING: State

C-52

INTRODUCING A NOVEL BIORELEVANT IN VITRO DISSOLUTION METHOD FOR THE ASSESSMENT OF NICOTINE RELEASE FROM ORAL NICOTINE AND TOBACCO PRODUCTS

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As the nicotine release from a product is important to the acceptability of the user, it may be useful to assess nicotine performance/release as a target for comparing new and existing products. However, *in vivo* studies are expensive and introduce physiological and behavioural variables into the evaluation of the nicotine products. Therefore, a standardized *in vitro* procedure is desired. While the performance test for cigarettes is



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well-developed and standardized, smokeless products do not have an equivalent test. Therefore, the aim of this study was to develop a versatile biorelevant *in vitro* dissolution method for the assessment of nicotine release from oral nicotine and tobacco products. The proposed method was calibrated and validated with *in vivo* nicotine release. The proposed method is based on testing in a μ DISS ProfilerTM from Pion Inc. (MA, USA) with six channels without the in-line UV probes connected. Pouches were weighed individually, loaded into custom-made sinkers and placed on the bottom of the standard 20 mL dissolution vessels with 20 mm cross-shaped magnetic stirrers on top. The magnetic stirrers were set to operate at 100 rpm and the minibath temperature was set to 37 °C. The experiment was carried out in 10 mL of artificial saliva. Samples were taken at t = 5, 10, 15, 30, 45, 60, 90 and 120 min and analysed for nicotine content using HPLC-UV (260 nm). These *in vitro* parameters were determined by calibrating the nicotine release from a non-tobacco nicotine product (ZYN Dry 6 mg) and a tobacco containing snus product (General White 8 mg) with *in vivo* extraction data from the same two products. The *in vitro* method was able to discriminate the nicotine release between the two different products. Consequently, the proposed *in vitro* dissolution method can most likely be applied to assess the nicotine release from the majority of oral nicotine and tobacco products with different geometry such as Swedish snus, moist snuff, nicotine pouches, and dissolvables.

FUNDING: Unfunded

C-53

ANXIETY SENSITIVITY, PAIN DISABILITY, AND CO-USE OF CIGARETTES AND E-CIGARETTES AMONG ADULTS WITH CHRONIC PAIN

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Significance: A recently proposed conceptual model identified anxiety sensitivity (fear of arousal-related sensations) as a likely transdiagnostic factor in comorbid chronic pain and nicotine dependence (LaRowe et al., 2018). Anxiety sensitivity has been associated with more severe pain disability (Mehta et al., 2016) and the maintenance of cigarette/e-cigarette dependence (Zvolensky et al., 2009, 2019). Smokers with pain (vs. no pain) also are more likely to co-use e-cigarettes, and greater pain disability has been shown to predict quicker latency to smoking lapse (Powers et al., 2019a, 2019b). **Methods:** The goal of the current study was to examine cross-sectional relationships between anxiety sensitivity, pain disability, and likelihood of current cigarette and e-cigarette use/co-use. Specifically, we hypothesized that anxiety sensitivity would be associated with greater pain disability, which in turn, would be associated with a greater likelihood of cigarette/e-cigarette use and co-use. Participants included 273 online survey respondents who endorsed past-month alcohol use and current chronic musculoskeletal pain (34.4% female; 36.3% non-white; $M_{age} = 32.9$). **Results:** Analyses indicated that anxiety sensitivity was indirectly and positively associated with likelihood of current cigarette smoking, e-cigarette use, and cigarette/e-cigarette co-use via greater pain disability ($ps < .05$). Direct positive associations between anxiety sensitivity and e-cigarette use/co-use of cigarettes and e-cigarettes were no longer significant after accounting for pain disability. **Conclusion:** Collectively, these findings are consistent with the notion that anxiety sensitivity may play an important role in pain-nicotine use reciprocity (Ditte et al., 2011, 2019; LaRowe et al., 2020). Individuals with chronic pain and elevated anxiety sensitivity may benefit from nicotine cessation interventions that incorporate more adaptive strategies for managing pain and anxiety-related sensations. Prospective research is needed to explicate temporal effects of anxiety sensitivity in relation to the progression of pain-related functional impairment, and use/co-use of nicotine/tobacco products.

FUNDING: Unfunded

C-54

SYSTEMATIC SMOKING CESSATION OUTREACH TO PATIENTS WHO DO NOT ENGAGE IN PRIMARY CARE

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Significance: The US Public Health Service Clinical Practice Guideline recommends clinicians address tobacco use at every office visit. National surveys suggest that a quarter of smokers in the US do not receive primary care annually. The implementation of systematic outreach to engage these patients who do not present in primary care could expand the reach of evidence-based smoking cessation treatment. **Methods:** A

Midwestern healthcare cooperative with six primary care clinics developed a Cigarette User Registry to enable tobacco dependence care management. Tobacco treatment specialists queued up daily reports from the Registry of clinic patients without an in-person encounter in the prior 365 days and attempted telephone outreach with those smokers to offer support in smoking cessation. Patient demographics and outreach outcomes were extracted from the electronic health record to evaluate the demographics of patients and the reach of telephone outreach. **Results:** Of 3,407 patients on the Registry, 565 (16.6%) had not seen a primary care provider in the past year. These patients were younger (42 vs. 44 yrs., $p = 0.004$) and more likely to be male (60% vs. 52% male, $p=0.0002$) and some-day rather than everyday smokers 27% vs. 21% some-day, $p=0.003$) than were those with past-year primary care visits. Of these 565, 271 (48.0%) were called, 143 (53% of those called) were reached, and 33 (23% of those reached) set a quit date. Amongst the patients attempted for outreach, those reached within 3 attempts did not differ significantly by age, sex, race, insurance status, or frequency of tobacco use from those not reached. **Conclusions:** Patients who do not present for primary care at least annually are likely to be younger, male, and less frequent smokers, on average, than those seen annually. These patients are receptive to telephone outreach. Adopting proactive outreach has the potential to enhance the reach of smoking cessation treatment in a patient population that engages in primary care infrequently.

FUNDING: Federal

C-55

PRELIMINARY ASSESSMENT OF THE IMPACT OF THE COVID-19 PANDEMIC ON CIGARETTE SMOKING AMONG SEXUAL AND GENDER MINORITY (SGM) YOUNG ADULTS

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Significance: The COVID-19 pandemic and its sequelae are disproportionately impacting marginalized groups. Recruitment for our pilot trial of a smoking cessation intervention for SGM young adults coincided with the early period of the COVID-19 pandemic (May-June 2020). To assess the impact of the pandemic on smoking in this tobacco-related disparities group, we asked participants at baseline whether and how their smoking had changed relative to the pre-COVID period. **Methods:** Participants were 25 young adults, age 18-30, who smoked at least one cigarette per day and identified as sexual minority ($n=25$; 100%) and/or gender minority ($n=8$; 32%). Participants were enrolled in a single-arm pilot trial of a targeted digital intervention designed for smokers at all stages of readiness to quit. Enrolled participants completed a baseline survey with two COVID-related items. **Results:** Of the 25 participants, 4 (16%) reported that their smoking decreased, 8 (32%) reported that their smoking increased, and 13 (52%) reported that their smoking remained the same after the COVID-19 pandemic began. Among decreasees, reasons included "going out" less, lower stress, no smoke breaks from structured activities, and job loss resulting in less money to spend on cigarettes. Among increasees, reasons included more unstructured time (due to job loss, in some cases), higher anxiety/stress, isolation, and boredom. Among those whose smoking didn't change, reasons included unsuccessful efforts to reduce or quit smoking, adapting to restrictions by smoking indoors, no change in activities (e.g., still going to work), and the perception that COVID-related risks for smokers is a variation on a theme they've heard before (i.e., that smoking increases risk of disease). **Conclusions:** Almost half of SGM young adults reported COVID-related changes in smoking frequency, and most of those changes (8/12) were increases. Elucidating the reasons for COVID-related increases in smoking, as well as reasons for staying the same, can help to inform targeted interventions to address smoking during the pandemic as well as to better understand barriers to and facilitators of change in smoking among SGM young adults.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

**C-56****PREDICTORS OF SMOKING REDUCTION AMONG AFRICAN AMERICAN AND LATINX SMOKERS IN A RANDOMIZED CONTROLLED TRIAL OF JUUL E-CIGARETTES**

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Significance: E-cigarette (e-cig) use is widespread and may play an important role in facilitating cigarette cessation and reduction. Racial/ethnic minorities are less likely than Whites to use e-cigs and suffer disproportionate tobacco-related disease, making them a priority population for harm reduction. This paper explores factors associated with cigarette smoking reduction among African American (AA) and Latinx smokers enrolled in a randomized controlled trial assessing toxicant exposure in those assigned to JUUL e-cigs or smoking as usual. **Methods:** Participants were randomized in a 2:1 fashion to either receive 6 weeks of JUUL e-cigs or continue smoking cigarettes as usual ($N=187$). This secondary analysis focuses on the 114 participants randomized to e-cigs. We modeled the number of cigarettes smoked in the past 7 days at baseline and at week 6 follow-up as a function of *a priori* selected predictors using a Poisson model fit with generalized estimating equations. **Results:** Over the six-week study, cigarette smoking decreased from an average of 85.2 to 18.6 cigarettes per week. Significant factors associated with smoking reduction included the number of JUUL pods used throughout the study (Incidence rate ratio; IRR = 0.94 [0.91, 0.96], $p < 0.001$), cigarette dependence (IRR = 1.03 [1.01, 1.05], $p = 0.004$), and baseline cotinine level (IRR = 1.19 [1.03, 1.37], $p = 0.020$). **Conclusions:** AA and Latinx smokers reduced their cigarette consumption while using JUUL e-cigs. Higher e-cig use during smoking cessation/reduction interventions, as well as lower baseline dependence and cotinine may facilitate a transition to smoking fewer cigarettes, offering an opportunity to narrow health disparities resulting from cigarette smoking.

FUNDING: Federal

C-57**ELECTRONIC REFERRALS PROVIDE QUITLINE ACCESS TO THE MOST VULNERABLE POPULATION**

Niharika Khanna¹, Elena Klyushnenkova¹, David Quinn², Sara Wolfe². ¹University of Maryland Baltimore, Baltimore, MD, USA, ²Maryland Department of Health, Baltimore, MD, USA.

Background: University of Maryland Epic electronic health record has two-way communication with the Maryland Tobacco Quitline and utilizes a Clinical Decision Support system. **Methods:** Data collected since January 2018 - December 2019 yielded 1790 individuals who have been referred to the Maryland Quitline utilizing electronic referrals. We explored frequency of acceptance of tobacco cessation services by demographics, co-morbidities, insurance type and neighborhood deprivation using the Area Deprivation Index (ADI). Associations between groups of comparison were assessed using Chi-square test with significance level established at $\alpha=0.05$. **Results:** Sixty percent of referred individuals lived in areas with high neighborhood deprivation, measured with Maryland ADI (ranks 8-10), 82% were African Americans. Overall, 322 of patients (18%) accepted Quitline services. The acceptance rate was highest among younger (<25 years old) and older (65+ years old) patients compared to other age groups (23% versus 16-18%, $p=0.0136$), and was higher in females compared to males (20% versus 15%, $p=0.0004$). Among African Americans, 24% accepted Quitline services compared to 10-13% of other races ($p<0.0001$). Hypertension, Diabetes, HIV and Schizophrenia diagnoses were positively associated with Quitline service acceptance. In contrast, patients with history of drug abuse had lower acceptance rate compared to other patients (10% versus 18%, $p=0.0208$). Quitline service acceptance rate was highest in individuals with Medicare (24%, $p=0.0001$). Quitline service acceptance rate was significantly higher in ADI (ranks 8-10) compared to ADI (ranks 1-7) (23% versus 9-13%, $p<0.0001$). **Conclusion:** The use of electronic referrals and two-way communication with the Maryland Quitline has provided a solution to reaching individuals with tobacco dependence in the most vulnerable demographic groups: youth and patients age 65+, those with hypertension, diabetes and schizophrenia. In addition, the referral process was successful in providing a 'free' telephone resource for tobacco cessation to Medicare beneficiaries and those living in the most deprived neighborhoods.

FUNDING: State

C-58**DISPARITIES IN SMOKING CESSATION ASSISTANCE BETWEEN PRIMARY CARE SAFETY NET CLINICS**

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Significance: Safety net clinics are important settings for reducing smoking-related disparities as they serve socioeconomically disadvantaged patients with high smoking prevalence. While we know disparities exist in treatment provision across primary care clinics, very few studies have examined what contributes to these differences. **Methods:** This mixed methods study used electronic health records (EHR) data from adult patients identified as 'current smoker' during at least 1 primary care visit in 2014 to at least 1 Oregon OCHIN safety net clinic to calculate rates of counseling receipt and medication orders. Five clinics were purposely sampled to conduct site visits and semi-structured interviews based on high/low performance on counseling receipt and/or medication orders via EHR data extraction. Semi-structured interviews were conducted with 36 providers/staff and 30 current/former smokers. An immersion crystallization approach was used for qualitative analysis. **Results:** For counseling receipt, an integrated smoking cessation model of care with consistent referral to behavioral health versus a more siloed treatment approach distinguished the high ($n=2$ clinics) versus low performers ($n=3$ clinics). For medication orders, while all clinics had a sliding fee scale for lower income patients, the two high performing clinics also were able to provide free medications, either through a voucher program or allowing patients to put self-pay costs on a 'tab' in which there were no penalties for non-payment. Regardless of performance, providers/staff and patients at all clinics identified similar factors associated with decreased likelihood of offering/accepting treatment, including: current treatment of other substance use disorders, low social determinants of health such as poverty and unstable housing, and a focus on other medical/psychiatric comorbidities. **Conclusions:** Combining EHR and qualitative data provides important insight into disparities between clinics in provision of smoking cessation assistance. Decreased barriers to medication costs and integrated care with consistent behavioral health referrals are associated with higher rates of medication orders and counseling provision, respectively. Patients in safety net clinics also have unique challenges that need to be addressed to increase assistance. Targeted interventions at both the patient- and clinic-level are necessary to decrease smoking rates among our vulnerable populations.

FUNDING: Federal

C-59**EARLY SMOKING INITIATION AS A RISK FACTOR FOR COPD PROGRESSION**

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Smoking is a key risk factor for developing chronic obstructive pulmonary disease (COPD). The smoking experience and the number of cigarettes smoked matter. However, the age at which smoking started is also an important indicator. Pulmonary function is stable until about 25 years of age, and then FEV1 declines annually, and the rate of decline in smokers is much higher, as is well known from the classic Fletcher and Peto model. Earlier smoking involvement is associated with earlier death in COPD patients. The natural history of COPD was monitored in 170 men. The average age at the time of inclusion was 60.09 ± 1.31 years. The monitoring has been carried out for 15 years. In accordance with the GOLD classification, COPD of the following severity was diagnosed: GOLD 1 - 20 patients (11.7%), GOLD2 - 118 patients (69.5%), GOLD3 - 26 patients (15.3%), GOLD 4 - 6 patients (3.5%). The pack-years index averaged 43.95 ± 2.09 . The average age at the beginning of smoking was 14.73 ± 0.84 years and significantly differed ($p<0.05$) for stages I and IV (16.5 ± 1.67 and 12.4 ± 2.03 years, respectively). The survival rate during the observation period was 30%. The average age of smoking initiation in the group of patients who died before 60 years was 12.4 years, while in the group of those who lived over 75 years it was 15.65 years ($p<0.05$). Thus, the age of smoking initiation is a factor in the more severe course of COPD and poor prognosis and should be taken into account in monitoring patients, as well as in the development of anti-smoking programs aimed at preventing early involvement in smoking.

FUNDING: Unfunded



C-60

TOBACCO USER CHARACTERISTICS AND RATES OF REFERRAL TO SMOKING CESSATION SERVICES AT A FQHC IN CALIFORNIA

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Significance: Despite persistent tobacco control efforts, low-income Californians are 1.8 (RR) times more likely to be current smokers, and 21% less likely to quit successfully than other smokers (California Health Interview Survey 2018). At Family Health Centers of San Diego (FHCS), one of the ten largest Federally Qualified Health Centers (FQHCs) in the nation, there is a need to better understand utilization of evidence-based cessation services to optimize point of service contacts for both patients and healthcare providers. **Methods:** We conducted retrospective data analysis of electronic health record (EHR) system identified adult "tobacco users" from 1/1/2019-12/31/2019 at FHCS. We examined the demographic, insurance, co-morbid medical and psychiatric statuses associated with referral patterns to California Smokers' Helpline (CSH) or engagement in FHCS-based behavioral counseling and/or pharmacotherapy. Logistic and hurdle models quantified associations with tobacco-referral and numbers engaged in cessation services. **Results:** Among smokers (n=19,959), 95% fell below 200% of the federal poverty level, 23.4% were uninsured, 8% were >=65 years, 33% were Hispanic, 15% were Black, and 39% were Non-Hispanic White. EHR screening and referral was common with 87% referred to cessation services (67% CSH and 20% FHCS). Being uninsured (AOR=2.7; 95CI: 2.5-3.0), poverty (AOR=1.4, 95CI: 1.1-1.8), multiple psychiatric diagnoses (AOR=1.3, 95CI: 1.1-1.5), and fewer medical problems (p<0.01) were associated with lower odds of referral. Among those accepting referrals within FHCS, 63% did not engage, 24% received medication alone, and 6% received recommended combined medication and counseling. Smokers more likely to engage FHCS-based care included older smokers, women, and smokers with more co-morbid medical, psychiatric, and substance use problems (p's <0.01). **Conclusion:** Health disparities highlighted by the above data reveal a significant gap between referral and uptake of cessation services in low income smokers. Increased and improved surveillance of quitting in this difficult-to-reach population is needed in order to design effective delivery of specialized interventions. Improvement in engagement will be a key area to focus on in intervention efforts.

FUNDING: State

C-61

THE EFFECT OF NON-TOBACCO-BASED NICOTINE POUCH ON SNUS-INDUCED LESIONS

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Significance: Snuff-induced lesions (SILs) in the oral mucosa, where a pouch is placed, is commonly found in snuff users. These lesions are reversible *i.e.* clinical and histologically tissue changes are back to normal following cessation of snuff habit. However, the exact mechanisms behind these changes are unknown. **Objectives:** The main aim of the study was to investigate to which extent ZYN[®] has the potential to produce SILs at the site of application in the oral cavity. The second aim was to compare the effects of ZYN[®] to regular tobacco-containing snuff products, on the production of pro-inflammatory cytokines in mononuclear cells *in vitro*. **Methods:** Subjects (n=57) were encouraged to substitute their snuff with the ZYN[®] test products. Clinical visits were scheduled at baseline, after 2, 4 and 6 weeks. SILs at the site where participants typically place their snuff-pouch were assessed using a 4-degree scale. Human peripheral blood mononuclear cells (n=11) were exposed to ZYN[®] and 5 different snuff products for 24 h *in vitro*. Bio-Plex Pro™ assay was used for analysis of 48 different cytokines. **Results:** There was a statistically significant change in the degree of lesions at the placement of the pod between baseline and 6 weeks with a reduction from 2.2 ± 1.1 to 1.2 ± 1.1. All tested snuff products showed significantly higher production of pro-inflammatory cytokines compared to unstimulated cells and ZYN[®] products. **Conclusions:** The study showed that increased usage of ZYN[®] products improved oral mucosal lesions in healthy regular snuff users. Regular snuff induced significant production of inflammatory cytokines *in vitro*. The ZYN[®] products inhibited the production of pro-inflammatory cytokines compared to other types of snuff products and thus do not induce inflammation. This may be related to the improved clinical appearance of the oral mucosa in the subjects that used ZYN[®] test articles.

C-62

EXAMINING THE ROLE OF BEHAVIORAL ECONOMICS IN ANTEPARTUM SMOKING STATUS

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Significance: This study explores using behavioral-economic demand in combination with conventional smoking characteristics and sociodemographics to predict quit attempts among pregnant women. Antepartum quit attempts predict late-pregnancy quitting and thus were used as a proxy for late-pregnancy smoking abstinence. **Method:** Participants were a national sample of 401 pregnant women seeking to enroll in a smartphone-based smoking-cessation trial. Data were taken from an intake assessment that examined demand using the Cigarette Purchase Task (CPT), antepartum quit attempts, pre-pregnancy and antepartum smoking characteristics, and sociodemographics. Bivariate analyses compared sociodemographic and smoking characteristics of women who did vs. did not report a quit attempt in the current pregnancy. Principle Component Analysis was used to assess whether the five CPT indices (Intensity, Omax, Pmax, Breakpoint, Alpha) loaded onto two latent factors (Amplitude & Persistence). Finally, stepwise regression was used to predict antepartum quit attempts using all significant variables in the bivariate analyses and CPT latent factors. **Results:** There was a two-factor solution to CPT; Intensity loaded exclusively on Amplitude and all other indices on Persistence. Variables associated with quit attempts in bivariate analyses were: time to first cigarette (TFC) pre-pregnancy, TFC antepartum, cigarettes per day (CPD) antepartum, age at first cigarette, race/ethnicity (all *ps*<.05). Variables in the final regression model were: CPD antepartum, TFC antepartum, Persistence, and race/ethnicity (all *ps*<.05). As CPD and Amplitude were highly correlated, a second regression was conducted excluding CPD. The variables retained in that model were: TFC antepartum, Amplitude, Persistence, and race/ethnicity (all *ps*<.05). **Conclusion:** These results demonstrate that CPT latent factors Amplitude and Persistence are significantly associated with antepartum quit attempts. Further research is needed to parse their predictive value relative to conventional predictors but these results suggest that CPT latent factors have a contribution to make in predicting smoking cessation among pregnant women.

FUNDING: Federal; Academic Institution

C-63

RELATIONSHIP BETWEEN DAILY CORTISOL FLUCTUATIONS, DEPRESSIVE SYMPTOMS, AND SMOKING SYMPTOMATOLOGY IN WOMEN ON ORAL CONTRACEPTIVES

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Background: Women have greater difficulty quitting smoking than men, possibly due to higher incidence of stress and depression in female smokers. A decline in cortisol levels has been linked to increased risk of relapse and changes in depressive symptoms in women. This study examined the association between daily cortisol fluctuations, depression, and withdrawal in women on birth control while smoking *ad libitum*. We hypothesized that declining cortisol levels would correlate with increased depression and negative symptoms. **Methods:** Participants were non-pregnant female smokers with average age 24.5 years who were on oral contraceptives and smoked an average of 11.6 cigarettes/day. Data was collected during the placebo week of *ad libitum* smoking. Participants provided saliva cortisol samples and completed Subjective State Scales (SSS), which included scales of positive affect, negative affect, cigarette craving, physical symptoms, and withdrawal. SSS measures and cortisol levels were collected at five different time points daily: just after waking, thirty minutes post-waking, two hours post-waking, at 8:00 pm, and before bed. A Center for Epidemiological Studies Depression Scale (CESD) was completed once daily. The relationships between cortisol, SSS scales, and CESD scores were assessed with linear mixed effect models. **Results:** Final analysis included 41 participants. As expected, cortisol levels varied throughout the day (p<0.001), with levels peaking after waking and declining throughout the day. A 1 point increase in reported withdrawal symptoms was associated with a 33% decrease in cortisol levels (11-49% decrease, p = 0.006), and a 1 point increase in reported negative affect was associated with a 30% decrease in cortisol levels (10-45% decrease, p = 0.005). There was no significant associations between cortisol levels and positive affect, cigarette craving, physical symptoms or CESD. **Conclusion:** Findings demonstrated that a decrease in cortisol is correlated with increased negative affect and withdrawal symptoms in female smokers.

FUNDING: Federal; Other

**C-64****CORRELATES OF E-CIGARETTE USE AMONG ADULTS INITIATING SMOKING CESSATION TREATMENT**

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Background: Little is known about the impact of electronic cigarette (EC) use on combustible cigarette (CC) cessation. The current study characterized EC use among adults enrolled in smoking cessation treatment, and evaluated the impact of EC use on CC cessation. **Methods:** Participants were adult CC users referred for tobacco cessation treatment. Participants completed a pre-quit baseline assessment with follow-ups at 4, 12, and 26 weeks post-quit. Logistic regression analyses were conducted to evaluate the impact of pre-quit EC use on biochemically-verified CC cessation. **Results:** Participants ($N=649$) were predominantly female (58%), White (61%) or Black (28%), with a mean age of 52 ($SD=12$) years. Participants reported smoking 17 ($SD=10$) cigarettes per day (CPD) for 30 ($SD=14$) years. At baseline, 65% of participants had ever-used ECs and 23% reported past 30-day EC use. Compared with CC-only users, participants who reported past 30-day EC use were younger (49 vs. 53 years, $SD=12$, $p<0.01$), more likely to report an annual household income $< \$21,000$ (70.0% vs. 59.1%, $p=.01$), smoked more CPD ($M=19.0$ vs. $M=16.4$, $p<0.01$), and had higher scores on the Heaviness of Smoking Index ($M=3.4$ vs. $M=3.0$, $p<0.01$). EC use was less common among Black smokers than among other racial/ethnic groups (17.2% vs. 25.4%, $p=.03$). Among those who completed the 4-, 12-, and 26-week follow-ups, 6.4%, 7.4%, and 8.1% reported dual use, respectively; and 2.7%, 3.4%, and 2.7% had switched to exclusive EC use. Past 30-day use of ECs at baseline was not associated with the likelihood of CC cessation at any follow-up. However, among those who reported past-30 day EC use, using ECs at least once per week was associated with a lower likelihood of CC cessation at the 12- (aOR 0.38, 95% CI: 0.15, 0.93) and 26-week (aOR 0.34, 95% CI: 0.13, 0.94) follow-ups relative to those who used EC less often. **Conclusion:** Findings indicated that use of ECs was associated with socioeconomic disadvantage, non-Black race, greater daily CC use, and greater nicotine dependence. Further, while EC use did not impact smoking cessation overall; among users, a higher frequency of pre-quit EC use adversely impacted cessation.

FUNDING: State

C-65**OPIOID MISUSE AND CIGARETTE SMOKING STATUS IN US ADULTS RESULTS FROM THE NATIONAL SURVEY ON DRUG USE AND HEALTH 2015-2018**

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Background: "Opioids" includes heroin and prescription pain relievers such as hydrocodone and oxycodone. In 2018, approximately 10.3 million of Americans misused opioids and 2 million had an opioid use disorder (OUD). Despite previous studies suggesting common co-use patterns of tobacco and opioids, a knowledge gap still exists on this relationship at the national level. In particular, few studies have examined this association controlling for key potential confounds, such as psychiatric distress and polysubstance use. **Methods:** We used data collected in the National Survey on Drug Use and Health (NSDUH) from 2015 to 2018 ($N=171,766$). We conducted multivariable logistic regression models to examine the likelihood of past-year opioid misuse and use disorder as a function of past-month tobacco use (e.g., cigarettes, cigars, pipe and smokeless tobacco), after controlling for survey years, demographic factors, past-month drug use (e.g., alcohol, marijuana, and illicit drugs), as well as past-year psychological distress (assessed by Kessler-6) and past-year major depressive episode (MDE). **Results:** In multivariable models, past-year opioid misuse was associated with past-month cigarette smoking (aOR=1.65; 95% CI=1.51, 1.80) and past-month other tobacco product use (aOR=1.22; 95% CI=1.09, 1.36). Past-month cigarette smoking is also associated with past-year OUD (aOR=3.60; 95% CI=3.01, 4.30) (all $ps<0.05$); though, there was no significant difference in OUD by past-month other tobacco products use. **Conclusions:** This study highlights the higher likelihood of having opioid-related problems in smokers at the national level. Current cigarette smoking was associated with a more than 3.5 times higher odds of having OUD, even controlling for other substance use and psychiatric illness. Even though opioid-dependent smokers are interested in quitting smoking, the quit success rate is low, possibly due to poor adherence to

tobacco treatment (e.g., smoking cigarettes to cope with negative affects). Cessation interventions, such as psychoeducational interventions, may be needed as routine care for opioid-dependent smokers.

FUNDING: Unfunded

C-66**NICOTINE DEPENDENCE MANAGEMENT IN A SMOKE-FREE DRUG AND ALCOHOL UNIT**

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Significance: Smoke-free policies and practices (CO monitoring, NRT, pharmacotherapy, behavioural interventions) have been introduced to manage nicotine dependence in inpatient drug and alcohol facilities however it is thought that such practices are underutilised. Since the introduction of a smoke-free policy to our inpatient drug and alcohol facility, there has been no objective evaluation of its practices. **Methods:** We administered a questionnaire to 42 smokers admitted to an inpatient drug and alcohol facility in a tertiary hospital in Sydney, Australia. A retrospective record review was performed for demographic data, substance use, psychiatric diagnosis and nicotine dependence assessment and management. Descriptive analyses and tests of association were conducted. Open-ended questions were subjected to content analysis. **Results:** Daily cigarette consumption documented for 41 (98%), Time To First Cigarette for 39 (93%) and CO monitoring performed for 42 (100%) patients. Patients' views of the management strategies were generally positive, although many interventions were underutilised. Those with high nicotine dependence were more likely to approve of NRT patches than those with low nicotine dependence ($p=0.009$). **Conclusion:** The results of this study demonstrate that smokers reported benefit from a range of low-cost interventions that can be easily delivered in any setting however many were underutilised. Future research could consider why certain strategies were not utilised and help improve uptake.

FUNDING: Unfunded

C-67**TOBACCO CIGARETTE SMOKERS WHO ENDORSE GREATER INTOLERANCE FOR NICOTINE WITHDRAWAL ALSO REPORT MORE SEVERE INSOMNIA SYMPTOMS**

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Significance: Insomnia is more prevalent among smokers than in the general population and has been shown to predict worse cessation outcomes. It has been suggested that nighttime nicotine withdrawal may help to explain why tobacco cigarette smokers are more likely than nonsmokers to experience clinically significant insomnia. Intolerance for aversive states has been implicated in the onset of insomnia, and intolerance for nicotine withdrawal symptoms could play a role in sleep disturbance among smokers. The goal of these secondary analyses was to examine whether smokers who endorse greater intolerance for smoking abstinence report greater difficulty initiating and/or maintaining sleep. **Methods:** Participants included 226 adult cigarette smokers (42.9% female, $M_{CPD} = 22.0$) who completed the baseline session of an experimental study that included assessment of current/historical smoking behavior, perceived intolerance for smoking abstinence, and insomnia severity/impact on functioning. **Results:** Results indicated that smokers who endorsed greater intolerance for nicotine withdrawal also reported greater insomnia severity and impact, even after accounting for general distress intolerance and sociodemographic factors ($ps < .001$). Logistic regression further revealed that, for every one-point increase in nicotine withdrawal intolerance scores, smokers were nearly twice as likely to score above threshold for clinically significant insomnia ($p = .001$). **Conclusions:** Collectively, these findings suggest that intolerance for nicotine withdrawal may warrant consideration as a potentially modifiable vulnerability factor in comorbid insomnia and nicotine/tobacco dependence. Future prospective and experimental research will be needed to clarify causal relations between intolerance for nicotine withdrawal, the experience of nighttime nicotine withdrawal, and the onset/severity of insomnia symptoms.

FUNDING: Federal



C-68

VALIDATING A MEASURE OF THERAPEUTIC ALLIANCE FOR TOBACCO CESSATION COUNSELING FOR BEHAVIORAL HEALTH CLINICIANS

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Significance: Increasingly, behavioral health clinicians (BHCs) are asked to provide tobacco dependence interventions. It is important to measure their ability to do so. While the Working Alliance Inventory (WAI) is a well-established measurement of therapeutic alliance and outcome, it is not specific to tobacco dependence interventions. Further, while the Working Alliance Inventory for Tobacco (WAIT-3) is valid for tobacco cessation counselors, its validity has not been established for BHCs who address tobacco cessation as part of addressing all other patient needs. The purpose of this study was to examine the concurrent and construct validity of the WAIT-3 in the context of general behavioral health clinicians. **Methods:** Wisconsin Community Support Programs and Comprehensive Community Services distributed anonymous surveys programs to 15% of their patients. **Results:** Compared to those with lower WAIT-3 scores, those with higher scores: reported more attempts to quit; were more motivated to quit; were more likely to have a smoking cessation/reduction goal in their general treatment plan; had more conversation about quitting with their BHC; and wanted more help from their BHC to quit. **Conclusions:** The WAIT-3 may be a valid way to measure the ability of BHCs to address the tobacco use of their patients.

FUNDING: State

C-69

MINDFULNESS-BASED RELAPSE PREVENTION FOR SMOKING AND ALCOHOL USE PILOT STUDY RESULTS

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The combined use of cigarettes and alcohol is associated with an increased risk of morbidity and mortality. Continued alcohol use while quitting smoking increases risk for relapse. Addressing both behaviors concurrently is likely to improve health outcomes and increase success for quitting smoking. Nonetheless, efficacious interventions that address both behaviors concurrently are lacking. The current study addresses this issue by modifying mindfulness-based relapse prevention (MBRP, a group-based intervention consisting of 8 weekly sessions) to create a primary treatment for smoking cessation and alcohol use modification (MBRP-SA). This treatment was piloted using 3 cohorts. Primary outcomes were retention, acceptability ratings at the end of treatment, and open-ended feedback of experience by participants. The 21 who consented were 48% female with a mean age of 51.40 (SD=10.71). Fifteen completed the first treatment session and 8 completed all 8 sessions. At the end of treatment, the average rating of likelihood to continue utilizing the skills learned was 8.50 (SD=2.38, 1-10 scale). The average rating of likelihood to use those skills for tobacco cessation was 4.00 (SD=1.41, 1-5 scale) and for alcohol modification goals was M=4.50 (SD=1.00, 1-5 scale). Open-ended feedback consisted of suggestions for modifying the session handouts, a preference for accessing meditations online (versus CD) and receiving visit reminders via text message. Participants liked receiving weekly treatment emails post-group and noted feeling a sense of connectedness to the group. Overall, participants would recommend the program to others. Feedback from this pilot study has been incorporated into the ongoing RCT that is assessing the feasibility and acceptability of MBRP-SA versus cognitive behavioral therapy. These results may also inform the development of other group-based mindfulness treatments among similar populations.

FUNDING: Federal

C-70

CIGARETTE USE AMONG U.S. ADULTS WITH SUBSTANCE USE DISORDERS FROM 2015 TO 2018: INVESTIGATING DIFFERENCES BY CANCER STATUS

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Introduction: Up to 30% of patients continue to smoke cigarettes following a cancer diagnosis and 30% of cancer deaths are caused by tobacco use. While cigarette smoking in the United States (US) general population declines, this decrease is not seen in those with comorbid substance use disorders (SUD). Few studies have examined SUD in cancer patients and it is unclear whether SUD differentially impact cigarette smoking and quit rates in patients with vs. without cancer. The present study used epidemiological data to estimate national trends in smoking prevalence and quit ratios among US adults with and without SUDs by cancer diagnosis status. **Methods:** Data were drawn from the 2015-2018 National Survey on Drug Use and Health public use data files (combined n=171,766). Current smoking prevalence's and quit ratios (ratio of former to ever smoking) were estimated across survey years by cancer diagnosis (with vs. without current diagnosis) and by SUD (with vs without past-year diagnosis; combined for one or more substances) among adults. Exploratory trend analyses for smoking prevalence's and quit ratios were conducted via logistic regression models over time (2015-2018). **Results:** Among those with cancer, the smoking prevalence was significantly higher among those with vs. without SUD (47% vs 13%, p<0.001) and the quit ratio was significantly lower among those with vs. without SUD (45% vs 71%, p=0.002). A similar pattern was observed in non-cancer patients with vs. without SUDs for smoking prevalence (56% vs 21%, p<0.001) and quit ratios (23% vs 51%, p<0.001). For both persons with and without SUD, the smoking prevalence was lower and the quit ratio was higher for persons with vs. without cancer (ps<0.05). Exploratory trend analysis suggested no changes across survey years for smoking prevalence or quit ratio by cancer diagnosis status. **Conclusions:** Among US adults with and without cancer, individuals with SUD evidenced significantly higher cigarette smoking and lower quit ratios than those without SUD. Providers should closely monitor poly-substance use in cancer patients and smoking cessation treatment among those SUDs may require specialized intervention effects.

FUNDING: Unfunded

C-71

EFFECT OF TOBACCO USE ON SLEEP IN OPIOID DEPENDENT INDIVIDUALS MAINTAINED ON BUPRENORPHINE

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Background Nicotine is the most common substance of abuse worldwide. Using both opioids and tobacco enhances subjective positive effects and satisfaction with drug use, reduces withdrawal symptoms for both substances, and act as a substitution when one drug is unavailable. Patients using both the substances frequently complain of sleep problems in withdrawal and during abstinence. **Methodology** Using a cross-sectional study design, 106 opioid-dependent patients maintained on buprenorphine for at least six months and on same dose in past month with no other psychotropic medications were interviewed. Use of nicotine and other substance use was assessed by ASSIST questionnaire. Sleep was assessed by Pittsburgh sleep quality index (PSQI). Association between subjective sleep parameters, socio-demographics, nicotine use and treatment related variables was also studied. **Results** All participants were males. Their mean age was 41.1 years (SD:14.3). Mean age of onset of tobacco use was 15.6 years (SD 5.4) and opioid use was 23 (SD 6.5) years. The median duration of tobacco use was 22 years (IQR 13, 38). Tobacco dependence (as per ICD-10 criteria) was present in 98.1% (n= 104). Majority of participants used tobacco (92.5%, n=99) in the past 3 months, majority of whom (n= 93, 87.7 %) used it on daily basis. Out of 106, nine participants were smokeless tobacco users, 28 participants were smokers and 69 were dual users. The mean duration of illicit opioid use was 10 years (IQR: 5,22). About 63.2% (n=67) had PSQI scores more than 5 denoting sleep problem. Mean subjective total sleep time of the sample was 403.5 (SD 94.8) minutes and median sleep latency was 35 (IQR 18.8, 62.5) minutes. Subjective total sleep time was significantly higher in participants who had use tobacco in the past three months (p value=0.03) and who were in moderate ASSIST risk category for tobacco (p value=0.04). **Conclusion** A sizeable proportion of opioid dependent patients on buprenorphine with tobacco use have sleep problems.

FUNDING: Unfunded; Academic Institution

**C-72****USER ENGAGEMENT WITH THE NCI'S SMOKING CESSATION APPS AMONG YOUNG ADULTS WITH SERIOUS MENTAL ILLNESS: RESULTS FROM A PHASE 1B PILOT STUDY OF USER ENGAGEMENT**

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Significance: Young adults with serious mental illness (SMI) are a vulnerable population with higher rates of smoking and a lower likelihood of achieving abstinence compared to young adults without SMI. Scalable interventions such as smartphone apps with evidence-based content (e.g., the National Cancer Institute's QuitGuide - QG, or quit-START - qS) could increase access to potentially appealing and effective treatment for this group, but have yet to be tested in this population. **Methods:** We conducted usability and acceptability testing of QG and qS among participants with SMI, aged 18-35, who were stable in community mental health treatment in 2019-2020. Participants were randomly assigned to use QG or qS on their smartphone. Evaluation of app use data from a 2-week home trial period was completed using descriptive statistics. **Results:** Participants were 17 smokers not interested in quitting, mean age 29 years old (SD=4), 41 percent female, 94 percent White, and 41 percent with psychotic disorders. Participants smoked 15 cigarettes per day (SD=7). Administrative app use data from the 2-week trial period were available for 15 participants. Users assigned to QG opened the app a mean total of 7 times (SD=5), on 6 days (SD=3), and completed a median of 1 notification (range 0-10). In contrast, users assigned to qS opened the app a mean total of 44 times (SD=29), on 12 days (SD 3), and completed a median of 19 notifications (range 1-39). Patterns of QG use over the trial period were similar among participants with and without psychotic disorders, while users with psychotic disorders appeared to open qS fewer times per day after the first week than those without (1.7, SD = 1.3 vs. 3.7, SD = 2.2). Acceptability ratings (agreed with "I liked using the app") at start and end of the trial period was stable for QG users (56% at both times), while acceptability improved for qS users (25% to 63%). **Conclusions:** In this pilot study of young adult smokers with SMI, users assigned to qS interacted with the app dramatically more than those assigned to QG. qS users responded to frequent notifications, and opened the app over 80% of days. After the first week, qS users with psychosis used the app less than those without psychosis. These data suggest high engagement with qS, but app modifications or clinical support are needed to enhance prolonged engagement among users with psychotic disorders.

FUNDING: Federal; Academic Institution

C-73**TOBACCO HARM REDUCTION IN CONSUMERS OF BEHAVIORAL HEALTH SERVICES**

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Consumers of mental health and substance mis-use health services consistently demonstrate a rate of combustible tobacco use two to three times the general population. As a consequence, these communities consistently incur the greatest adverse impact of smoking in the way of cardiovascular and respiratory diseases and pre-mature mortality. These communities also exhibit the lowest quit rate when compared with the general population. This mixed methods observational study will assess the impact of a Tobacco Harm Reduction model as defined by allowing participants to set their own tobacco use change goal; providing choice of nicotine, medication or no chemical aid strategy; weekly intensive counseling for six months. The model builds upon principles and practices of Self-Determination Theory and Motivational Interviewing. Research participants engage in monthly measures which include: the Fagerstrom Test of Nicotine Dependence, Working Alliance Inventory, Challenges to Stopping/Changing Smoking, Smoking Decisional Balance, Smokerlyzer Carbon Monoxide assay and the Behavioral Diagnostics Smoke Signature saliva assay. The protocol also includes participant focus groups and tobacco intervention counselor semi-structured interviews to aid in a more in depth understanding of facilitators and barriers in achievement of individual tobacco use goals. Individuals receive modest cash compensation for their participation for each intervention and monthly measure monitoring. Results of this study are in progress but early indications find that recruitment has become increasingly challenged by the Covid-19 pandemic and has required a more creative and aggressive approach. However, individuals do indicate a receptivity and appreciation for the more flexible and intensive approach and support in changing their behavior. Outreach and engagement in these communities is likely to continue to require an intensive and sustained effort.

FUNDING: Nonprofit grant funding entity; Other

C-74**PSYCHOLOGICAL DISTRESS AMONG CALLERS TO THE NEW YORK STATE SMOKERS QUITLINE (NYSSQL)**

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Significance: Although mental health conditions clearly have an impact on smoking cessation, valid and efficient assessment of mental health by Quitlines is complicated by many factors including stigma, self-report of diagnoses, and disparities in access to mental health practitioners. Psychological distress is indicative of many mental health conditions and has been found to be an accurate proxy for past month mental health status. We examined the use of the 6-item Kessler Psychological Distress Scale (K6) to assess psychological distress among callers to the New York State Smokers Quitline (NYSSQL). We examined the prevalence of psychological distress among callers and demographic and substance use differences between those with and without psychological distress. **Methods:** Participants (n=19,222) included adult tobacco users who called the NYSSQL from 2019-2020. Higher scores are indicative of more psychological distress, range 0-24. Serious psychological distress (SPD) was defined as K6 score of ≥ 13 ; Moderate psychological distress (MPD) 5-12; Low or no distress (LNPD) < 5 . Seven-day point prevalence abstinence outcome assessments were conducted by email and phone 7 months after intake. Logistic regression was used to examine the K6 predicted abstinence rates controlling for demographics (i.e., sex, age, race, education) cigarettes per day, time to first cigarette, alcohol and cannabis use. **Results:** Over one-third of callers (36%) met criteria for MPD and one in ten (11%) met criteria for SPD. Compared to callers with LNPD, participants with MPD and SPD were more likely to be women, be of lower educational level, smoke more cigarettes per day and sooner after rising, use cannabis, and binge drink. At the outcome assessment, callers with LNPD (35.7%) were more likely to be abstinent from smoking compared with participants with MPD (34.5%) and SPD (22.7%) (chi square p-value <0.001). **Conclusions:** Among callers to the NYSSQL, MPD and SPD is highly prevalent and associated with higher nicotine dependence levels and other substance use and tobacco treatment outcomes. Addressing mental health issues common among quitline callers may help to improve quit rates.

FUNDING: State

C-75**CHARACTERIZING DESIRE AND ATTEMPTS TO QUIT TOBACCO USE AMONG ADULTS USING CANNABIS FOR THERAPEUTIC PURPOSES**

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Significance: There is evidence of high rates of tobacco and cannabis co-use, with lower rates of tobacco cessation among those who use cannabis. However, less is known about the relationship between cannabis used for therapeutic purposes and tobacco use and cessation. We sought to examine desire, and attempts to quit using tobacco products among patients at a medical marijuana dispensary. **Methods:** Participants (N=697) were adults receiving cannabis for therapeutic purposes from a medical marijuana dispensary. We examined patterns of e-cigarette and combustible cigarette use and desire and attempts to quit cigarettes and e-cigarettes. We used descriptive statistics and chi square and independent samples t-tests analyses to examine the relationship between tobacco and cannabis use. **Results:** Approximately 54% of participants (n=372) reported ever use of a nicotine-containing e-cigarette. Of individuals who reported ever use of e-cigarettes, 30.6% (n=97) indicated that they stopped using e-cigarettes for a day or longer over the past year because they were trying to quit e-cigarettes. Among ever e-cigarette users, approximately 40% (n=154) reported "current" use of e-cigarettes, with 40% (n=61) using e-cigarettes every day, and 60% (n=93) reporting occasional use. Approximately 25% of participants (n=176) reported current combustible cigarette smoking, with two-thirds (n=109) reporting daily use. Most (n=134) reported plans to quit combustible cigarettes within the next 6 months, and more than half (n=97) had already made an attempt to quit combustible cigarettes within the past year. There were no significant associations between current tobacco use status and days of cannabis use, reasons for cannabis use, or type of qualifying condition for receiving medical marijuana prescription, all ps > 0.05 . **Conclusion:** Most adults who use cannabis for therapeutic purposes report co-use of tobacco products and past attempts or future interest in quitting tobacco products. Given evidence in the literature that tobacco use outcomes may be impacted by cannabis use behavior, further assessment of these relationships in adults using cannabis for therapeutic purposes is warranted.

FUNDING: Unfunded



C-76

A PSYCHOMETRIC EVALUATION OF THE COMMITMENT TO QUITTING SMOKING SCALE AMONG VETERAN SMOKERS WITH MENTAL ILLNESS

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Significance: Measurement of declared commitment to smoking cessation has been limited, particularly within tobacco-related health disparity populations and when compared to other constructs like motivation or self-efficacy. This study represents a psychometric evaluation of the Commitment to Quitting Smoking Scale (CQSS) among a sample of 147 Veteran smokers with mental illness participating in two independent clinical trials. We hypothesized that the CQSS would possess a single factor solution, provide reliable measurement, and demonstrate convergent, discriminant, and predictive validity. **Methods:** Factor structure, internal consistency, and convergent, discriminant, and predictive validity of the CQSS was assessed. **Results:** Contrary to our hypothesis, the CQSS was best represented by a two-factor structure - a Perseverance Factor assessing resolve with sustaining a quit attempt, and a Negative Affect Factor defined by sustaining abstinence despite mood-related smoking triggers. Both factors showed adequate internal consistency (Cronbach's $\alpha > 0.74$), were significantly positively associated with other measures of smoking cessation cognitions, and possessed lower correlations with unrelated demographic and smoking-related factors. Generalized estimating equations showed that the Perseverance Factor of the CQSS significantly predicted 24-hour quit attempts and 7-day point prevalence abstinence after receiving treatment (aOR's > 2.70 , p 's $< .016$), while the Affect Factor did not (aOR's > 1.01 , p 's $> .146$). **Conclusion:** The CQSS represents a clinically useful measure of commitment to smoking that encapsulates commitment as a combination of perseverance and coping with negative mood states in the context of smoking cessation. Future research should consider commitment to quitting as measured by the CQSS as a potential mechanism of change or treatment target.

FUNDING: Federal; State

C-77

TRANSDERMAL NICOTINE PATCH USE BY SMOKERS WITH SCHIZOPHRENIA DURING BEHAVIORAL SMOKING CESSATION TREATMENT

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Significance: We sought to examine compliance with transdermal nicotine patch use in smokers with schizophrenia and the association with reduction in smoking over 30 days during behavioral smoking cessation treatment. **Methods:** We used data from a pilot study (N=24) of an experimental behavioral intervention plus transdermal nicotine patch for smoking cessation among smokers with schizophrenia and schizoaffective disorder. For the current study, our sample consisted of 18 smokers with a SCID-5 confirmed diagnosis of schizophrenia or schizoaffective disorder who attended at least three treatment sessions (because that is when participants were given nicotine patches to be worn starting on their quit date, which was scheduled for the day of their next treatment session). We assessed compliance with wearing the nicotine patch and daily smoking using the Timeline Followback. We used descriptive statistics to characterize the sample and a linear regression to examine the association between nicotine patch use and change in smoking over the 30 days following the target quit date, controlling for age and number of sessions attended. **Results:** On average, smokers in the current study were 49.5 years old (SD=10.42) and 55.6% were female (n=10). Participants reported smoking 13.89 cigarettes per day (SD = 9.16) on the target quit date. On average, participants attended 7.17 sessions (SD=1.38) out of 8 total sessions and wore the nicotine patch on 13.67 days (SD=12.19) in the 30 days following their target quit date. Days of nicotine patch use was associated with change in smoking over the 30 days following the quit date [F(3, 14)= 10.281, $p = .001$], R Square = 0.688]. Change in smoking increased 0.277 (indicative of a reduction in smoking), for every day of compliance with the nicotine patch. **Conclusion:** Findings suggest that many smokers with schizophrenia are compliant with wearing the nicotine patch, which may be associated with reduction in smoking during behavioral cessation therapy. Interventions to target increased nicotine patch compliance (e.g., motivational interviewing) may improve smoking outcomes in smokers with schizophrenia.

FUNDING: Federal

C-78

DIFFERENCES IN THE APPEAL OF THE JUUL SYSTEM IN FOUR FLAVORS BETWEEN SMOKERS OF MENTHOLATED AND NONMENTHOLATED COMBUSTIBLE CIGARETTES

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OBJECTIVE: Smokers of mentholated (vs. nonmentholated) cigarettes demonstrate increased levels of nicotine dependence and decreased rates of smoking cessation. Prior research has assessed the appeal of electronic nicotine delivery systems (ENDS) in flavors, however there are limited data examining variation in the appeal of ENDS in flavors among menthol cigarette smokers. This clinical, in-laboratory study evaluated differences in the product appeal of the JUUL System (JS; Juul Labs, Inc.) in four flavors, combustible cigarettes, a comparator ENDS and nicotine gum between smokers of mentholated and nonmentholated combustible cigarettes. **METHODS:** Adult smokers (N=66; 48.5% menthol smokers; 50.0% female; mean age=41.1 years; 63.6% white, 27.3% African-American; JUUL-naïve) completed a 7-arm within-subjects cross-over product-administration study while confined to a clinical laboratory setting. On each study day participants used 10 puffs of the JS in four flavors (Virginia Tobacco, Mint, Creme, Mango [all 5.0% nicotine]), their usual brand (UB) combustible cigarette, a comparator ENDS (VUSE Solo; 4.8% nicotine; tobacco flavor) or chewed one piece of 4mg White Ice Mint nicotine gum ("chew and park") for 30 minutes. Ratings of product liking and intent-to-use-again were assessed 60-minutes post-product use on 100-point visual analog scales. Menthol cigarette smoking was tested as a between-subjects moderator of test product appeal in multi-level linear models. **RESULTS:** There was a significant interaction between menthol smoking and ratings of product appeal ($ps < 0.03$). Smokers of mentholated (vs. nonmentholated) cigarettes rated Virginia Tobacco JS lower on measures of product liking (Menthol Smokers: Mean [SE] = 48.18 [5.28]; Nonmenthol Smokers: Mean [SE] = 68.12 [5.10]; $p = .008$) and intent-to-use-again (Menthol Smokers: Mean [SE] = 42.40 [5.86]; Nonmenthol Smokers: Mean [SE] = 60.81 [5.67]; $p = .03$). There were no significant differences in the appeal of Mint, Creme and Mango JS, UB cigarette and comparator ENDS between menthol and nonmenthol smokers ($ps > 0.10$). Menthol (vs. nonmenthol) smokers rated the mint nicotine gum higher on intent-to-use-again (Menthol Smokers: Mean [SE] = 52.64 [5.93]; Nonmenthol Smokers: Mean [SE] = 29.49 [5.67]; $p = .006$). **CONCLUSIONS:** In this controlled laboratory study smokers of mentholated (vs. nonmentholated) cigarettes rated tobacco-flavored JS lower on measures of product appeal. ENDS in tobacco flavors may be less appealing to smokers of mentholated cigarettes.

FUNDING: E-cigarette/Alternative nicotine products Industry

C-79

ASSESSING THE EFFECTS OF SWITCHING FROM COMBUSTED CIGARETTES TO THE TOBACCO HEATING SYSTEM RELATIVE TO SMOKING CESSATION ON BIOMARKERS OF POTENTIAL HARM - ADDITIONAL EVIDENCE ON THE POTENTIAL TO REDUCE THE RISK OF SMOKING-RELATED DISEASES

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Significance The Institute of Medicine considers favorable changes in biomarkers of potential harm (BoPH) associated with smoking-related morbidities appropriate for estimating the reduced risk of cigarette alternatives in absence of epidemiological evidence. This could offer smokers who would otherwise continue smoking faster access to substantiated less harmful alternatives. A core of eight BoPHs, reversible upon smoking cessation (SC) and associated with smoking-related diseases, were selected on the basis of Hill's criteria to estimate the reduced-risk potential of switching from cigarettes to the Tobacco Heating System (THS) among smokers in clinical studies. To evaluate the clinical relevance, changes in these BoPHs were evaluated in THS switchers against smokers who exclusively stopped using any tobacco or nicotine containing products (e.g. cigarette) as SC is the best path to risk reduction. **Methods** The exposure response study (ERS) was an overall 12-month investigational period (6-months [NCT02396381], extended by 6 months [NCT02649556]), in adult healthy smokers unwilling to quit, randomized to THS use or cigarette smoking. Concurrently, a 12-month smoking cessation study (SCR) was conducted with adult healthy smokers willing to quit (NCT02432729). The baseline comparability of data among the THS, cigarette, and SC groups was evaluated by a propensity score approach. The effect magnitude in THS users was benchmarked against that in the quitters for each BoPH. **Results** THS users (n=248), with over 70% THS use, showed favorable BoPH changes versus smokers (n=398), congruent with the quitters (n=327). At least 40% of the SC effect was preserved for



5 of the 8 BoPHs. In THS users with CEMA (BoExp to acrylonitrile) levels <40 ng/mg creatinine (n=93), more than 66% of the SC effect was preserved for: high-density lipoprotein C; white blood cell; forced expiratory volume in 1 s; carboxyhemoglobin; total 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol; 8-epi-prostaglandinF2 α ; and s-intercellular adhesion molecule-1 levels. Overall, the preserved SC effect in THS users ranged between 44.3% and 100% across the 8 BoPHs. **Conclusions** The preserved SC effect when switching from cigarettes to THS provides evidence that THS potentially reduces the risk of development of smoking-related diseases in smokers who would otherwise continue smoking.

FUNDING: Tobacco Industry

C-80

PHARMACOKINETIC MODELING AND SIMULATION OF SINGLE AND MULTIPLE USES OF AN ORAL TOBACCO-DERIVED NICOTINE PRODUCT COMPARED TO MOIST SMOKELESS TOBACCO PRODUCTS AND COMBUSTIBLE CIGARETTES UNDER ACTUAL USE CONDITIONS

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Significance: The U.S. Food and Drug Administration (FDA) recommends that tobacco product manufacturers provide information regarding the abuse liability of tobacco and nicotine products to support new and modified risk tobacco product applications. Typical tobacco abuse liability assessment involves comparison of the nicotine pharmacokinetics and subjective effects of the new product relative to controls (e.g., cigarette; NRT) under single-use, controlled clinical conditions. While this information is critical for understanding the relative speed and efficiency of nicotine delivery and associated subjective experience, it does not provide information on the extent of nicotine exposure under actual use conditions. **Method:** Pharmacokinetic (PK) models based on nicotine concentration-time data from two PK studies were used to simulate nicotine PK profiles from tobacco products under various usage scenarios. In the current analysis, nicotine PK profiles were simulated for an oral tobacco derived nicotine (OTDN) pouch (4mg and 8mg nicotine), cigarette, and moist smokeless tobacco products under various usage scenarios based on data from an actual use study. **Results:** A 2-compartment model with zero-order input (intravenous constant infusion) provided the best fit to the data for all products (WinNonlin v.8.1). Taken together, results of these models suggest that adult tobacco consumers, under typical usage conditions, would likely be exposed to less nicotine during actual use of the OTDN pouches than they would during cigarette or ST use. **Conclusion:** The interpretation of PK models is constrained by the model parameters and assumptions employed. Despite their limitations, simulation of PK profiles under actual use behavior conditions may provide useful information to FDA in their evaluation of new or modified risk tobacco product applications.

FUNDING: Tobacco Industry

C-81

EVALUATION OF ABUSE LIABILITY OF TWO NICOTINE LOZENGE TOBACCO PRODUCTS COMPARED TO COMBUSTIBLE CIGARETTES AND NRT LOZENGE IN SMOKERS

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Using a 2-arm, 5-way crossover study design, we investigated subjective measures and pharmacokinetic characteristics of a dissolvable nicotine lozenge (mint-flavored hard and soft forms; hereafter referred to as investigational product lozenge [IPL]) when used by healthy smokers. Results after use of IPLs were compared with results after use of subjects' usual brand combustible cigarette (CC) and a nicotine replacement therapy (NRT) lozenge (high and low-abuse liability comparators, respectively). Adverse events (AEs) from product use were also collected. During confinement, subjects participated in 5 daily test sessions (following a 12-hour minimum tobacco/nicotine abstinence period) and were randomized to 1 of 5 products per session: CC, NRT, one IPL, or simultaneous use of 2 and 4 IPLs. Blood samples, subjective measures on 100 mm Visual Analog Scale, vital signs, and AEs were collected over the course of 6 hours prior to, during, and following product use. Results demonstrated that total nicotine uptake levels (AUC₀₋₃₆₀) over 6 hours were lower after use of a single IPL than those for CC and NRT and similar to or higher than CC after use of 2 and 4 IPLs. Mean scores for several product liking measures were statistically significantly lower for all IPL sessions compared to CC and not different from NRT. While the mean scores for "liking of positive effects"

after use of all hard and soft IPLs were generally similar to those for NRT, the "disliking of negative effects" increased with the number of IPLs used simultaneously. Mild AEs such as hiccups, nausea, and throat irritation were similar among IPLs and NRT, and for IPL, increased with increasing number of lozenges used simultaneously. Results suggest that the commercially-available IPLs included in this study have a low risk for abuse and an abuse liability less than CC and similar to NRT lozenge.

FUNDING: Tobacco Industry

C-82

CHARACTERIZATION OF NICOTINE PHARMACOKINETICS AND PHARMACODYNAMICS DURING USE OF DIFFERENT STRENGTHS OF ON!® NICOTINE POUCHES IN DUAL USERS OF CIGARETTES AND SMOKELESS TOBACCO

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Oral tobacco-derived nicotine containing products may offer noncombustible alternatives to adult smokers unable or unwilling to quit. In this study we characterized the nicotine pharmacokinetics and pharmacodynamics (subjective measures) of Mint on!® nicotine pouches (ONPs) which are available in 1.5mg, 2mg, 3.5mg, 4mg and 8mg nicotine strengths. **Method:** A randomized seven-way crossover study characterized nicotine pharmacokinetics (PK) of ONPs relative to subject's own brand tobacco products in 30 dual users of cigarettes and moist smokeless tobacco (MST). PK assessments were conducted during use of one ONP (Mint, all nicotine levels), or 2g MST for 30 minutes or one cigarette smoked in 5 minutes. Subjects completed questions about urges to smoke, craving cigarettes and how pleasant they rated the products. **Results:** The plasma nicotine maximum concentration (Geometric Least Square Means, ng/ml) followed the ONP nicotine levels and ranged from 3.2 (1.5mg) to 14.5 (8mg) and 10.5 and 9.2 for cigarette and MST, respectively. The median time to maximum concentration ranged from 31.5-35 minutes for ONPs and 7.5 and 35 minutes for cigarette and MST. ONP use reduced ratings of urge to smoke or craving a cigarette and increased ratings of pleasant, but not to the extent of own brand cigarette or MST. **Conclusions:** Nicotine pharmacokinetic profiles of the ONPs indicate that the rate and extent of nicotine uptake reflects the ONPs nicotine levels and the subjective effects of ONPs do not reach the level of subjects own brand cigarette or MST. We conclude that ONPs have lower abuse liability than cigarettes and MST and may be an acceptable switching product for adult smokers and MST users.

FUNDING: Tobacco Industry

C-83

THE FIRST COMPLETE ZOROASTRIAN PARSİ MITOCHONDRIAL REFERENCE GENOME AND GENETIC SIGNATURES OF AN ENDOGAMOUS NON SMOKING POPULATION

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Significance The present-day Zoroastrian-Parsis have roots in ancient pastoralist migrations from circumpolar regions leading to their settlement on the Eurasian Steppes and later, as Indo-Iranians in the Fertile Crescent. After migrating from the Persian province of Pars to India, the Zoroastrians from Pars (referred to as the "Parsis") practiced endogamy within Indian society, preserving their genetic identity and social practices. Because of their religion, social ostracism was practiced against smokers within the Parsi community, resulting in an endogamous, non smoking community, forming the unique basis for this population genetics study. **Methods:** In order to understand the genetic consequences of the migration of the Parsis and their subsequent endogamy, decipher their phylogenetic relationships, and elucidate the disease linkages to their individual haplotypes, we generated *de novo* the Zoroastrian-Parsi Mitochondrial Reference Genome (AGENOME-ZPMS-HV2a-1), which is the first complete mitochondrial reference genome assembled for this group. **Results** Phylogenetic analysis of an additional 99 Parsi mitochondrial genome sequences showed the presence of seven major haplogroups and 25 sub-haplogroups and a largely Persian origin for the community. We also generated individual reference genomes for each major haplogroup and assembled the Zoroastrian-Parsi Mitochondrial Consensus Genome (AGENOME-ZPMC G V1.0), the first consensus genome assembled for this group. We report the existence of 420 mitochondrial genetic variants, including 12 unique variants, in the 100 Zoroastrian-Parsi mitochondrial genome sequences. Disease association mapping showed 217 unique variants linked to longevity and 41 longevity-associated disease phenotypes across the majority of haplogroups. Analysis of the coding genes, tRNA genes, and the D-loop region revealed haplogroup-specific disease associations for Parkinson's disease, Alzheimer's disease, cancers, and rare diseases. Our results further indicate that none of the variants



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studied are linked to known lung cancer variants. Mutational signatures that are linked to tobacco carcinogens, specifically, the C>A and G>T transitions, were found at extremely low frequencies in the Parsi cohort, reflecting the strong disapproval of smoking in the Zoroastrian religion. **Conclusion** In sum, the Parsi mitochondrial genome provides an exceptional resource for determining details of their migration from Persia to India and uncovering novel genetic signatures for wellness and disease.

FUNDING: Nonprofit grant funding entity; Tobacco Industry

C-84

ANALYSES OF LOSS TO FOLLOW-UP IN A LONGITUDINAL STUDY OF SMOKERS USING JUUL SYSTEM ENDS

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Toxicology studies and population modeling indicate that substantial public health benefits may accrue when smokers switch completely from cigarette smoking to using e-cigarettes. In two longitudinal studies, the majority of adult established smokers purchasing a JUUL System Starter Kit (JSK) report having switched away from smoking (no past-30-day smoking) a year later. However, the status of those lost to follow-up is not known, which raises questions of possible bias in switching rates due to non-response. We address the question of bias in two ways, in the context of a large (n=22,096) longitudinal cohort of adult smokers purchasing a JSK, with follow-ups at 1, 2, 3, 6, 9, and 12 months. First, we compare the demographics and tobacco history of enrollees who provided complete follow-up data (25%), partial follow-up data (54%), or no data after the baseline (22%). Differences between groups were extremely small (reduction in uncertainty and R²s ≤ 0.002), and some differences did not suggest that switching would be lower in those lost to follow-up (e.g., drop-outs were *less* cigarette-dependent). This suggests that loss-to-follow-up was not likely to have substantially inflated estimates of switching. Second, we report findings from a methodological study that recontacted a sample of 1,900 baseline smokers who did not respond at 12-month follow-up. Nearly half of those (46%, 95% CI: 44%-48%) reported past-30-day abstinence from smoking at time of re-contact, inconsistent with the concern that most drop-outs had typically reverted to smoking (the assumption made in ITT analyses of cessation intervention trials). Consistent with this, 4.5% (3.6%-5.5%) reported that they had missed surveys because they had reverted to smoking; 3.6% (2.8%-4.4%) said they skipped surveys because they had stopped using JUUL, but most (80.9%, 79.1%-82.6%) reported they had dropped for survey-process-related reasons (e.g., lack of time to complete surveys, not enough compensation). In summary, although the smoking status of non-responders cannot be known, so it is possible that their switching rates were lower, multiple analyses suggest that any response bias is likely to be limited.

FUNDING: E-cigarette/Alternative nicotine products Industry

C-85

COMPLETE SWITCHING AWAY FROM SMOKING AMONG JUUL PRODUCT USERS WHO HAD FAILED TO QUIT WITH FDA-APPROVED MEDICATIONS, AND SMOKERS NOT READY TO QUIT SMOKING

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The public health benefit of e-cigarettes rests on their potential to help smokers switch completely away from combusted cigarettes, which are responsible for the vast majority of tobacco-related mortality. A longitudinal study examined switching rates among 8,511 US adult established smokers who purchased a JUUL System Starter Kit (JSK), and who reported their smoking status 12 months later. The majority (59%, 95% CI 58-60%) reported having switched away from smoking (no smoking in the past 30 days), suggesting the potential for public health benefit. Even so, it has been suggested that smokers should use more traditional methods to stop smoking, such as medications approved by FDA for cessation. To address this concern, analyses examined switch rates among those who used cessation medications in their most recent quit attempt in the year preceding JSK purchase. Two thirds (66%) of these JSK purchasers had tried and failed to quit in the year preceding the purchase, and 25% of those had failed with FDA-approved medications, mostly relying on nicotine replacement therapy (NRT; 64% of medication-users). The majority of these NRT users (61%, 58-64%) reported complete switching at 12 months, as did the majority (54%, 50-58%) of those who had tried and failed to quit with prescription medicines. There could also be concern that e-cigarettes could attract smokers who are ready to quit away from cessation treatment

more broadly. However, the majority of smokers purchasing JSKs would not have been in scope for most cessation treatments at time of purchase, based on a standard measure of readiness to quit: 62% were not planning to quit within 30 days. Despite having not been ready to quit at the outset, a majority of these smokers (54%, 52-55%) reported having switched completely away from cigarettes 12 months later. Thus, the JUUL System was used for switching by smokers for whom there have been very few interventions and no FDA-approved pharmacotherapies. Overall, the data show that the JUUL System was used to achieve switching away from smoking by many smokers who are not currently completely served by available cessation options.

FUNDING: E-cigarette/Alternative nicotine products Industry

C-86

DEPENDENCE ON JUUL SYSTEM ENDS COMPARED TO DEPENDENCE ON CIGARETTES. PSYCHOMETRIC AND COMPARATIVE ANALYSES IN US ADULTS

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As more smokers switch from smoking to use of ENDS, it is important to understand ENDS dependence, in comparison to cigarette dependence. A challenge is that measures of ENDS dependence have relied on rewording scales for cigarette dependence, without psychometric analyses to establish validity and comparability of cigarette and ENDS scores. We analyzed data on the 4-item PROMIS scale (0=*never* to 4=*almost always*), developed for cigarette smoking, and reworded to assess dependence on JUUL Systems ENDS (JSE) in samples of US young adults (YA; 18-24, n=1,052) and adults (AD; 25+, n=1,631) who were exclusively smoking or using JSE, and (separately) on dual user using both. The psychometric evaluation included reliability, convergent/discriminant validity, item response function (via IRT), factorial validity and invariance testing (via CFA). For all groups, item response categories functioned as expected, reliability was adequate (Cronbach's $\alpha > .80$), and associations between scores and frequency of use provided some evidence of discriminant/convergent validity. In AD exclusive users, the CFA model fit adequately for smokers (n=1,261; CFI=.992, RMSEA=.082, SRMR=.016) and for JSE users (n=96; CFI=1.0, RMSEA=0.0, SRMR=.003). Metric and scalar invariance were confirmed, indicating that cigarette and JSE scores could be validly compared. JSE dependence (M=1.68, SD=0.97) was lower than cigarette dependence (M=2.08, SD=0.97), p<0.001. In AD dual users (n=274), the model fit for cigarette dependence (CFI=1.0; RMSEA=0.0; SRMR=.005), but not JSE dependence (CFI=.981; RMSEA=.171; SRMR=.020). In YA exclusive users, model fit was inadequate for both smokers (n=400) and JSE users (n=338), with RMSEA>.10. In dual users (n=314), model fit was adequate for cigarette dependence (CFI=1.0; RMSEA=.022; SRMR=.009) but not JSE dependence (RMSEA>.10), rendering all comparisons invalid. The analyses of this brief PROMIS scale illustrate the importance of psychometric analyses of scales when used to assess dependence on new products and varied populations, and emphasize the need to develop scales fit for these purposes. The analyses also show that adult users of JSE were less dependent than adult smokers.

FUNDING: E-cigarette/Alternative nicotine products Industry

C-87

THE EFFECT OF NON-TOBACCO-BASED NICOTINE POUCH (ZYN®) ON DENTAL PLAQUE CHARACTERISTICS

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Significance: The aim of the study was to assess the effect of non-tobacco-based nicotine pouch (ZYN®) on dental biofilm acidogenicity (short and long term) and amount. The ZYN® pouch is an alternative form of orally delivered nicotine in which matrix consists of maltitol and cellulose microcrystals instead of ground tobacco leaves. Maltitol and cellulose are not usually associated with changes in biofilm acidogenicity, however, the prolonged exposure (30-60 min) during the use of the product may cause vulnerability and caries risk. **Methods:** The study consisted of 2 parts. Ethical approval and informed consent were obtained from each participant. Part 1 was an open, randomized, 4-way crossover, single administration trial on 18 subjects. Flavoured and unflavoured brand of the nicotine pouch, 10% sucrose and 10% xylitol (controls) was tested. The nicotine pouch was kept in the vestibule for 60 min and the mouth was rinsed with controls for 1 min. Part 2 was an open, observational, follow-up study for 6 weeks on 57 subjects. Exposure to 10% sucrose was tested at baseline and after 2, 4, 6 weeks of pouch use. Dental plaque acidogenicity was measured on 2 buccal and 2 approximal surfaces in the upper-jaw at baseline and up to 60 min after administration using the microtouch method. The plaque amount was scored (0-3) on 6 tooth-sites. **Results:** After single-dose



administration (Part 1), $AUC_{7.5}$ for dental plaque acidogenicity was significantly smaller for the ZYN® products and xylitol compared to sucrose. There were no statistical differences between different ZYN® products. After ad libitum administration of nicotine-containing pouches (Part 2), $AUC_{7.0}$ for plaque acidogenicity during the study was significantly reduced comparing to baseline. No statistically significant changes in plaque amount were observed during the 6-week study. **Conclusions:** Dental plaque acidogenicity significantly decreased in healthy snus users after 6-week ad libitum administration of non-tobacco-based nicotine pouches (ZYN®).

FUNDING: Tobacco Industry

C-88

CHANGES IN RESPIRATORY FUNCTION, PHYSICAL CAPACITY AND METABOLIC SYNDROME AMONG SMOKERS OF CONVENTIONAL CIGARETTES AND USERS OF IQOS IN A 5-YEAR COHORT STUDY AFTER ONE YEAR OF OBSERVATION

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Significance This is the first analysis on the effect of cigarettes and IQOS heat-not-burn tobacco products (IQOS) on respiratory health, physical performance and metabolic syndrome based on 5-year prospective observational cohort study of 1201 participants. We present the results after one year of observation. **Methods:** Residents of Almaty, Kazakhstan 40-59 years of age, who smoke either combustible cigarettes or IQOS were recruited in a cohort study to analyze the effect of cigarette smoking or IQOS use on respiratory functions, 6-Minute-Walk-Test (6MWT), self-reporting COPD Assessment Test (CAT), and metabolic syndrome (MetS). We apply student's t-test, Pearson chi-square test, and two-sample test of proportion to test significance of the means or proportions. **Results:** Complete data were available from 1201 patients at the baseline and 1101 at the one-year follow-up assessment (OYA). At the baseline 400 participants were identified as IQOS users and 801 as cigarette smokers. By OYA these numbers were 362 and 670, respectively, plus three participants with unidentified smoking preferences, and 65 who had ceased smoking. Proportion with $CAT \geq 10$ decreased by over 13 percent for IQOS users and increased by over 8 percent for cigarette smokers. Mean CAT scores were significantly better for IQOS users vs. cigarette smokers ($p < 0.001$) at both assessment times and it decreased (not significantly) for both categories of smokers. Mean total distance walked in the 6MWT increased by 16 meters for IQOS users and 10 meters for cigarette smokers ($p < 0.05$). There was increase in FEV1 and FVC results after administering bronchodilator, however there was no significant differences in changes from the baseline to OYA. There was a significant reduction ($p < 0.05$) in proportion of people with MetS for those who use IQOS (10%) compared to cigarette smokers (3.5%). **Conclusion:** Preliminary finding suggest more positive changes for IQOS users vs. cigarette smokers in CAT results, the 6MWT, and metabolic syndrome by the one-year follow-up time. Longer period for observation is desirable to demonstrate if those changes are more pronounced.

FUNDING: Academic Institution; Tobacco Industry



POSTER SESSION 1: PUBLIC HEALTH POSTERS

PH-1

COMMUNITY VULNERABILITY AND REAL-TIME CONTEXT OF TOBACCO MARKETING EXPOSURE —AN ECOLOGICAL MOMENTARY ASSESSMENT AMONG NON-TOBACCO-USING YOUNG ADULTS

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INTRODUCTION High amounts of tobacco marketing have been found in vulnerable communities (VCs) and may lead to disproportionate use of tobacco products. Tobacco marketing exposure (TME) is a risk factor for tobacco use initiation. Ecological Momentary Assessment (EMA) is well-suited to capture the real-time context of TME within communities with varying risks of tobacco use. This study examined real-time TME among non-tobacco-using young adults. **METHODS** Data were from an EMA study that assessed context (e.g., location, activity) of TME using four text-messaging surveys per day over 14 days. Non-tobacco-using young adults (n=152; ages 18-24) living, working, or attending school in Washington D.C. recorded 5,285 surveys. Of these, twenty participants (13.2%) came from VCs with high proportions of lower income, racial/ethnic minority residents, and high smoking rates. Unadjusted and adjusted multilevel logistic regressions were used to assess the odds of exposure to any and flavored tobacco marketing in relation to community vulnerability and context. **RESULTS** Fifty-nine participants (40.4%) reported at least one TME and recorded 94 TME moments over 14 days. In adjusted analyses, odds of TME were higher among those from VCs (AOR=2.6, 95% CI=1.2-5.4), in the presence of anyone using tobacco vs. no tobacco use (AOR=4.2, 95% CI=2.5-7.1), outside/in transit (AOR=7.6, 95% CI=3.2-18.0), at store/retail (AOR=8.1, 95% CI=1.5-43.6), or online (AOR=2.8, 95% CI=1.0-8.2) vs. at home. Additionally, odds of flavored TME were higher among those from VCs (AOR=7.2, 95% CI=2.3-22.2), in the presence of anyone using tobacco vs. no tobacco use (AOR=4.3, 95% CI=2.1-8.9), or outside/in transit vs. at home (AOR=5.6, 95% CI=2.2-14.0). **DISCUSSION** Non-tobacco-using young adults may be predominantly exposed to tobacco marketing in social environments allowing tobacco use and through retail, outdoor and online/social media advertising. Individuals in VCs are at increased risk of seeing any and flavored tobacco marketing which could contribute to tobacco use disparities. Policies and programs are needed to reduce differential exposure to tobacco marketing and flavors to improve health equity.

FUNDING: Federal; Academic Institution

PH-2

SMOKING ATTITUDES AND BEHAVIORS FOLLOWING LUNG CANCER SCREENING ASSESSING SHORT TERM CHANGES AMONG PARTICIPANTS IN A TELEPHONE BASED CESSATION TRIAL PRIOR TO TOBACCO TREATMENT

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Significance: In the U.S., approximately 4 million current smokers are at high-risk for lung cancer and are eligible for lung cancer screening (LCS) via low-dose computed tomography. Undergoing LCS and receiving the screening result may promote an increase in motivation to quit as well as a reduction in smoking. Prior to the cessation intervention as part of the Lung Screening, Tobacco, and Health randomized controlled trial, we examined whether smoking attitudes and behaviors changed following LCS.

Methods: Participants (N=731) completed two phone assessments: pre-LCS (T0) and post-receipt of their LCS results (T1). Both interviews preceded randomization and assessed cigarettes per day (CPD), nicotine dependence, readiness to quit, confidence and motivation to quit, and perceived risk of lung cancer. At T1, we assessed the impact of the screening results on participants' desire to smoke. Changes were assessed using McNemar and paired t-tests. **Results:** The mean age of participants was 63.7 (SD=5.9) years, 90% were White, 51% were female, 36% had a high school degree/ GED or less, and 40% were undergoing their first LCS exam. Regarding tobacco-related characteristics, 90% smoked daily and 27% smoked within 5 minutes of waking. The median time between screening and the T1 was 14 days. There was a reduction in CPD between the T0 (M=18.4, SD=8.9) and the T1 (M=16.8, SD=8.8; p<0.001). Post-receipt of LCS results, 36% reported increased readiness to quit, 12% reported decreased readiness, and 52% had no change (p<0.001). Motivation to quit increased between assessments (p<0.05). Following screening, 20% reported increased perceived risk of lung cancer, 19% reported decreased risk, and 61% reported the same level of risk (p<0.05). At T1, 54% reported a decreased desire to smoke, 3% reported an increased desire, and 44% reported no change. Compared to those returning for an annual LCS, those undergoing their first scan were more motivated to quit and had greater perceived risk for lung cancer (p's <0.05). **Conclusion:** The time between registering for LCS and receiving the results may be an important period to engage smokers in cessation, when many report changes to smoking and perceived risk. This window may be particularly important among those undergoing their first scan who may be experiencing a heightened response to a health event.

FUNDING: Federal

PH-3

WHAT KIND OF SMOKING IDENTITY FOLLOWING QUITTING WOULD ELEVATE SMOKERS RELAPSE RISK. FINDINGS FROM THE ITC AUSTRALIA AND UK SURVEYS

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Significance: Research has suggested that smokers who quit smoking and continue to identify themselves as a smoker are at a greater risk of relapse than their counterparts who now describe themselves as either a non-smoker or an ex-smoker. It was unclear whether there are more nuanced differences. This study examines the relationship between post-cessation smoker identities and relapse risk of former smokers in Australia and the UK comparing those who identified themselves as either a non-smoker, an ex-smoker, or a smoker with a firm choice to no longer smoke versus those without expressing a firm choice (i.e., a smoker trying to quit smoking). Cross-country differences were examined. **Methods:** Data analysed came from 544 former smokers (quit 1 month or more) who participated in the International Tobacco Control (ITC) Australia and UK Waves 9 (2013) and 10 (2014) Surveys. Logistic regression models were used to examine prospectively the association between post-cessation smoker identities assessed at baseline and smoking relapse assessed at follow-up. **Results:** Baseline self-reported smoker identity independently predicted smoking relapse at 12-month follow-up (p<.01). Compared with the subgroup who identified themselves as smokers trying to quit, those who identified themselves as smokers who had chosen to no longer smoke (odds ratio [OR]=.01, 95% confidence interval [CI]=.01-.25, p<.001), ex-smokers (OR=.05, CI=.01-.25, p<.001) or non-smokers (OR=.07, CI=.02-.37, p<.001) were less likely to relapse at follow-up. No cross-country differences were found. **Conclusions:** Following quitting, smokers who maintained a smoker identity with a firm choice to no longer smoke or adopted a non-smoker or ex-smoker identity were less likely to relapse than those who failed to do so, suggesting that a clear rule/commitment to not smoke and/or a shift to a non-smoking identity may be protective of relapse.

FUNDING: Federal

PH-4

IMPACT OF SELF EFFICACY ON DAILY INTENTION NOT TO SMOKE

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Significance: To improve cessation interventions, it is necessary to identify and understand the factors associated with daily motivation to not smoke. One factor that has



been hypothesized is baseline self-efficacy or confidence in one's ability to abstain from smoking. However, there is a lack of evidence examining self-efficacy as a dynamic construct. This study examined the influence of baseline and daily self-efficacy on daily intentions to not smoke in smokers who were motivated to quit sometime in the future (i.e., in the contemplation stage). **Methods:** Current smokers (N=76, 51.5% female, age= 42.2 ± 12.2 years) completed measures of SE at baseline, and each evening during 28 days of ecological momentary assessment. Daily intention to not smoke (yes/no) was assessed each morning, and number of cigarettes was assessed each evening. GLMM controlling for sex, age, and nicotine dependence, was used to test if a daily measure of self-efficacy is more predictive than a baseline measure in predicting non-smoking intention. **Results:** Overall participants smoked on 91.8% (SD=0.27%) of days. Participants intended to not smoke on 45.0% (SD=0.33%) of days but were only successful on 16.87% (SD=0.37%) of days. Baseline SE was not correlated with mean daily rating of SE ($r=0.18$, $p=0.13$) or variance in ratings ($r=-0.10$, $p=.40$). People who had higher baseline SE were 2.3% more likely to set a non-smoking intention ($p=0.30$) while people who had a higher rating of SE on a previous night were 67.8% more likely to set a non-smoking intention ($p=.002$) on any given morning. Participants were 66% less likely to set an intention if they smoked on the previous day ($p=.009$) but were 288% more likely to set an intention again if they had set one on the previous day ($p>0.001$). **Conclusion:** The current data indicates that both overall and day-to-day fluctuations in SE influence daily intentions to not smoke in smokers who are interested in - but not yet ready to -quit. Future intervention research could examine the addition of methods designed to increase and maintain a person's daily self-efficacy and how this can be leveraged to encourage these smokers to attempt long-term cessation.

FUNDING: Nonprofit grant funding entity

PH-5

THE ROLE OF SUBJECTIVE SOCIAL STATUS ON CIGARETTE CRAVING AFTER EXPOSURE TO POINT OF SALE TOBACCO MARKETING

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Significance. Repeated exposure to point-of-sale tobacco marketing (POST-M) with and without discounts might contribute to smoking disparities because cigarette ads and discounts are more prevalent in low-socioeconomic neighborhoods. Subjective social status (SSS) refers to how someone perceives their status relative to others and is a powerful predictor of health outcomes, including smoking. We tested if SSS moderates the relationship between exposure to POST-M and cigarette craving. **Methods.** Two studies (exact replication of methods) examined cigarette craving after exposure to POST-M with discounts (vs. without discounts) in daily smokers. Participants viewed images depicting two rows of a cigarette power wall with cigarette packs from the participant's preferred brand with a multi-pack discount (discount condition) or a brand logo (control), using a within-subject design. On each trial participants viewed 4 unique images from the same condition in a row, then rated their cigarette craving on a 5-point scale. After the image task, participants reported SSS by selecting a rung on a 10-rung ladder indicating where they would place themselves relative to others in the U.S. in terms of money, education, and jobs. **Results.** In study 1 (N=152), craving was significantly higher after exposure to the discount condition (vs. control), $\beta=0.12$, $p<.01$, with particularly strong effects of condition on participants with higher SSS, who craved cigarettes more after POST-M with discounts (vs. control). There was no difference in craving between the POST-M conditions for low SSS participants, who craved more regardless of condition ($\beta=0.10$, $p<0.01$). In study 2 (N=129), craving was significantly higher for low SSS participants than high SSS participants for both conditions, $\beta=-0.16$, $p=.03$. Craving was directionally higher after exposure to the discount condition (vs. control) but the relationship was not significant ($p=0.22$) and not moderated by SSS. **Conclusion.** Exposure to POST-M was associated with higher craving for low SSS participants, regardless of condition. Results suggest that policies reducing point-of-sale cigarette ads are pro-equity by benefitting low SSS smokers. **Funding:** This work was supported by the National Cancer Institute, grant number 1R01CA229305-01A1.

FUNDING: Federal

PH-6

EXAMINING RISKS AND PROTECTIVE FACTORS FOR CIGARETTE SMOKING AMONG TRANSGENDER AND GENDER EXPANSIVE INDIVIDUALS USING DIGITAL PHOTOVOICE

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Background: Transgender and gender expansive (TGE) communities have a higher smoking prevalence of 35.5% compared to 14.9% in cisgender adults. This study examined risk and protective factors for cigarette smoking among TGE adult current smokers using digital photovoice methods. **Methods:** The study was guided by the minority stress model, resilience framework, and the socio-ecological model. We enrolled 47 TGE adults ages 18+ who are current cigarette smokers in the US using online advertising (Facebook, Instagram, Craigslist), community outreach, print flyers, and snowball recruitment. Participants first completed an online baseline survey. Next, they were assigned to private groups on either Facebook (5 groups) or Instagram (3 groups) and were asked to share pictures with captions of smoking risk and protective factors daily over 21 days. We then conducted a follow-up survey and focus group discussions for in-depth exploration and labelling of these factors in their own words within each group of participants. We coded these factors as those experienced by the general population or specific to TGE individuals. **Results:** General protective factors for smoking included concern for the health of pets and animals, engaging in healthy behaviors like exercise and nutrition, and being distracted by other tasks. General risk factors were work, school, and general stress, daily routines or habits, and substance use. Environmental factors, such as weather, and influence of friends or peers were illustrated as both risk and protective factors, depending on the context. TGE-specific risk factors included minority stress and harassment, while concern for transition-related health was a protective factor. While general factors were frequently discussed, TGE-specific factors were identified as important considerations for participants. **Conclusion:** These findings inform future research to identify general and unique smoking risk and protective factors among a larger sample of TGE adults and to develop culturally appropriate interventions to reduce smoking in this population.

FUNDING: Federal

PH-7

RURAL DISPARITIES IN LIFETIME SMOKING PREVALENCE ARE WIDENING OVER TIME

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Significance Rural residence is a well-established risk factor for adverse health behaviors and subsequent morbidity and mortality in the United States. Smoking is the primary cause of preventable death and more prevalent in rural America. As chronic smoking habits typically develop during adolescence, the discrepancy in smoking rates between rural and urban youth likely contribute to a significant geographic disparity in long-term health of adults. **Methods** Data were extracted from 12th-grader surveys of the Monitoring the Future study from 1998 to 2018. The historic trends of lifetime smoking and lifetime regular smoking rates of rural and urban adolescents were estimated with intercept-only time-varying effect models. Trends of the disparity in lifetime smoking prevalence among rural youth were calculated from these models. **Results** The disparity in lifetime smoking prevalence among rural youth has markedly increased since 1998. This steep increase in disparity resulted in a 13.5% higher prevalence of lifetime smoking among rural adolescents compared to their urban counterparts in 2018, compared to 6.9% in 1998. This discrepancy is among the highest that has been observed in the past 20 years and demonstrates an alarming upward trend. In contrast, the difference in ever-regular smoking prevalence has shown some fluctuations but an overall net decline, where the disparity between rural and urban youth decreased from 6.4% in 1998 to 4.8% in 2018. **Conclusion** Though overall smoking prevalence continues to decline, this trend is significantly attenuated among rural adolescents compared to urban youth. The increasing disparity in lifetime smoking prevalence may be attributable to disadvantaged sociodemographic factors, relaxed smoking norms within the community, weak regulatory enforcement and limited reach of anti-tobacco campaigns may be attributable to this emerging trend. This geographic disparity between rural and urban adolescents represents a potentially modifiable cause of increased morbidity and mortality in the rural area. Public health interventions and regulatory efforts should be tailored for rural adolescents to reduce this worsening health disparity.

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



PH-8

CRITICAL CHALLENGES IN QUANTIFYING VAPING BEHAVIOR: A QUALITATIVE STUDY OF YOUNG ADULTS IN SOUTHERN CALIFORNIA WHO VAPE

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Significance: Previous studies suggest that young adults who vape experience difficulty when answering questions about their vaping frequency. Investigators have struggled to develop appropriate survey items for quantifying vaping behaviors across the multitude of devices currently on the market that are both easy for participants to answer and that accurately quantify level of vaping exposure. The current study asked young adults who vape to provide suggestions on improving scientific measurement to quantify vaping. **Methods:** We conducted semi-structured qualitative interviews with 62 young adults who vape in Los Angeles, CA between June 2018 and June 2019. The interview guide was open-ended and elicited information on participants' thoughts, feelings, and experiences related to vaping. Here, we conducted a thematic content analysis on participants' responses to the following question: "What do you think is the best way for us to understand how much people vape?" **Results:** We identified three themes commonly mentioned by participants regarding the challenges of accurately quantifying vaping. First, many participants struggled to answer the question, and appeared to not actively monitor their vaping behavior and exposure levels. Second, participants discussed the variety of currently available devices and suggested that survey measures should be device-dependent (e.g., separate items for pod-based devices vs. open system devices). Finally, participants noted that vaping patterns (e.g., puff size, puff duration, frequency of use per day) vary across vapers regardless of the type of device used, which may impact data accuracy. In addition, several promising suggestions were made for better measures, which we plan to test in future research. **Conclusion:** This study provides perspectives from young adults who vape on accurately quantifying vaping behaviors. The lack of self-monitoring of vaping behavior contrasts sharply with the cigarette literature, where cigarette use is standardized and generally reliably recalled (e.g., "X packs per day"). Future research must further refine survey measures to more accurately quantify vaping behavior.

FUNDING: Federal

PH-9

PREVALENCE OF HEATED TOBACCO PRODUCT USE AMONG MEXICAN SMOKERS AND VAPERS

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Background: Heated tobacco products (HTPs) are purportedly less harmful than cigarettes, and could potentially play a role in offering a potentially-modified risk alternative for smokers. We examined the prevalence and correlates of current HTPs use among smokers and vapers in Mexico, a country that has banned HTPs imports, but that allows the sale of IQOS. **Methods:** Data are from two waves, November 2019 (n=1390) and March 2020 (n=1351) of an online survey of adult exclusive smokers and dual users. Participants included those who completed the first survey as well as new participants who participated in the second survey (replenishment survey to account for attrition). Self-reported measures included: sociodemographics, current use of HTPs, smoking and vaping frequency (i.e. dual sporadic and frequent user, e-cigarettes use less than once a week and at least once a week, respectively), intentions to quit smoking, smoking, vaping and HTPs use by family/friends, perception of HTPs harmfulness relative to cigarettes, exposition to information related to HTPs. Multilevel mixed-effects logistic regression models were estimated to account for repeated measures for cohort respondents, regressing current HTPs use on study variables. All data were weighted by sex, age, education, and smoking/vaping status of the general population of Mexican smokers. **Results:** Prevalence of HTP use was in 2019=0.74% & 2020=0.58% (not significantly differ between waves, p=0.53). Current use of HTPs was significantly higher among those aged 30-39 (AOR 0.31, 95%CI 0.12-0.78), and having a higher educational attainment (AOR 4.45, 95%CI 1.36-14.50). Dual users sporadic (AOR 8.74, 95%CI 2.95-25.92), and frequent (AOR 9.83, 95%CI 2.76-35.04) were more likely to be HTPs users compare to exclusive smokers. Those have friends/family users of e-cigarettes (AOR 5.92, 95%CI 1.73-20.28) and HTPs (AOR 4.93, 95%CI 1.59-15.34) were more likely to be HTPs users compare to those who did not have friends/family using them. Exposure to information about HTPs outside retail shops also was associated. **Conclusion:** Fewer

than one percent of smokers in Mexico use an HTP; however, smokers who also vape were more likely to report using them to compared to exclusive smokers. **Founding information:** 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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PH-10

CORRELATION BETWEEN DISPARITIES IN TOBACCO RETAILER DENSITY AND DISPARITIES IN CIGARETTE SMOKING IN OHIO

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Significance: Growing evidence suggests neighborhood density of tobacco retailers is positively associated with tobacco use. More tobacco retailers are located in neighborhoods with a high concentration of poverty and residents of color. This study examined the association between these disparities in tobacco retailer density (TRD) and disparities in the prevalence of cigarette smoking among adults in Ohio in 2017. **Methods:** We obtained data on licensed tobacco retailers from the Ohio county auditor offices (n=11,392) and data on cigarette smoking from the Ohio Behavior Risk Factor Surveillance System (n=12,289). Retailers were geocoded to determine their location within the state's 10 geographic regions. We defined disparities in TRD as a region's ratio of TRD in high vs. low poverty census tracts (as well as in high vs. low racial/ethnic minority tracts). We defined disparities in cigarette smoking as the ratio of prevalence of smokers in a region living at or below vs. above the poverty threshold (as well as smokers who were non-white vs. white). We estimated the Pearson correlation coefficient to assess the linear relationship between the TRD disparities ratios and both cigarette smoking disparities ratios. **Results:** The mean disparity in TRD ratios were 1.68 (poverty) and 1.05 (race/ethnicity), and the disparity in smoking ratios were 2.40 (poverty) and 1.22 (race/ethnicity). Poverty-based TRD disparities were significantly positively associated with poverty-based disparities in smoking (r=0.66, p<0.0001). Similarly, race/ethnicity-based TRD disparities were associated with race/ethnicity-based disparities in smoking (r=0.49, p<0.0001). **Conclusions:** Disparities in tobacco retailer density by poverty and race/ethnicity are associated with their respective disparities in cigarette smoking among adults in Ohio. To our knowledge, this is the first analysis linking these disparities, underlining the detrimental effect of environmental tobacco exposure on disadvantaged populations.

FUNDING: Federal

PH-12

CHARACTERISTICS OF ADULT USERS OF HEATED TOBACCO PRODUCTS: FINDINGS FROM THE 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: Contemporary heated tobacco products (HTPs) have further diversified global tobacco markets. Characteristics of HTP users in real world settings remain understudied. We evaluated associations between current HTP use and sociodemographics, nicotine-related perceptions, and patterns of polyuse among current and former smokers (18+ years) in four countries. **Methods:** Data were from current smokers, former smokers, or nicotine vaping product (NVP) users from the United States, Canada, England, and Australia (n=12,987) who participated in the 2018 ITC Four Country Smoking and Vaping Survey. Unweighted descriptive statistics were used to characterize current-monthly HTP users (n=443). Weighted logistic regression analyses assessed correlates of HTP use, controlling for sociodemographics, country, and current-monthly smoking and vaping status. **Results:** HTP users had a mean age of 31.1 years (non-HTP users: 44.7; p<0.001) and two-thirds fell in the highest SES category (67.7%). Most HTP users concurrently used both cigarettes and NVPs (89.8%). Among these polyusers (smoking+NVP+HTP; n=398), 83.5% smoked daily, 68.0% vaped daily, and 41.1%



used HTPs daily. In multivariable regression (aOR [95%CI]), past 30-day use of other combusted tobacco products (i.e., cigars) was associated with HTP use (8.62 [5.45-13.63]). Among cigarette smokers (n=10,281), planning to quit within 6 months (2.54 [1.74-3.71]) and reporting a quit attempt in the last 18 months (1.60 [1.08-2.36]) were positively associated with HTP use. Among vapers (n=4,615), experiencing negative side effects from vaping (6.52 [4.55-9.36]) and perceiving vaping as similarly or more harmful than smoking (2.33 [1.63-3.33]) were positively associated with HTP use. **Conclusion:** In this sample of adult current and former nicotine users, current-monthly HTP use was more common among those who were younger and more affluent, and most HTP users concurrently smoked and vaped daily. Smokers using HTPs appeared more interested in quitting smoking, and vapers using HTPs had experienced negative side effects from NVPs. Characteristics of HTP users may yield insight for future regulatory treatment of these products.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PH-13

RACIAL & ETHNIC TOBACCO DISPARITIES IN THE U.S. MILITARY

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U.S. military tobacco rates have historically been higher than civilian populations. Tobacco disparities in civilian adult and adolescent populations exist, with rates of current use of any tobacco product highest among non-Hispanic (NH) American Indian/Alaska Natives, Native Hawaiian/Other Pacific Islander, and multiracial individuals compared to other racial/ethnic backgrounds. Less is understood about military racial/ethnic tobacco disparities. The current study compared prevalence rates of current tobacco use across products by race/ethnicity (NH White, NH Black, NH Asian, NH Native Hawaiian/Other Pacific Islander, NH American Indian/Alaska Natives, NH multiracial, and Hispanic) in a large sample of U.S. Air Force trainees (N= 28,763). Next we compared prevalence rates across racial/ethnic groups to weighted rates in the National Health Interview Survey (NHIS) of U.S. adults and the National Youth Tobacco Survey (NYTS). In our military sample, e-cigarettes were used most commonly (12.1%), followed by cigarettes (7.3%), cigars (6.9%), smokeless tobacco (5.9%), hookah (3.3%), and pipe tobacco (0.6%). By product, for e-cigarettes, NH Native Hawaiian/Other Pacific Islander had the highest prevalence (16.2%) compared to other groups (Range: 5.0% NH Black - 15.3% NH White). For cigars, NH American Indian/Alaska Natives had the highest prevalence (8.6%) comparatively (Range: 1.9% NH Asian - 7.9% NH White). Similarly, for hookah, highest prevalence (4.7%) was among NH American Indian/Alaska Natives comparatively (Range: 2.7%: NH White - 4.3%: Hispanic). In the military sample, overall rate of any tobacco use was high (22.1%), particularly for NH White personnel (27.3%), compared to civilian adults (19.7%). However, in this sample, NH American Indian/Alaska Natives and NH Native Hawaiian/Other Pacific Islander personnel were disproportionately using e-cigarettes, cigars, and hookah. Comparisons to prevalence rates found in the NHIS and NYTS will be discussed. Results highlight the importance of tailoring tobacco interventions and policies specifically to the product used, particularly in the U.S. military, given tobacco disparities impacting products differently.

FUNDING: Federal

PH-14

ETHNIC DIFFERENCES IN THE TRAJECTORIES OF E-CIGARETTE MARKETING EXPOSURE, E-CIGARETTE USE, AND CIGARETTE SMOKING AMONG ASIAN/PACIFIC ISLANDER YOUNG ADULTS

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Commonly categorized with low-risk "Asian" groups, Native Hawaiian and other Pacific Islanders (NHOPI), who are indigenous to Hawaii and the Pacific Islands, are at high risk for tobacco product use, including e-cigarettes. We tested whether NHOPI are more likely to show growth in e-cigarette marketing exposure over time and whether the increase in e-cigarette marketing exposure is associated with increase in e-cigarette use and cigarette smoking. Prospective survey data were collected from 2335 young adult college students [18-25 years old at baseline; 55% women; 20% NHOPI, 19% Filipino, 26% East Asians (Japanese, Chinese, Korean), 24% White, 11% Other] at 4 time-points in 6-month intervals. E-cigarette marketing exposure was assessed based on the cued-recall method and point-of-sale exposure. Latent Growth Curve Modeling was used to test the hypotheses. Significant positive growth trajectories were found for

e-cigarette marketing exposure and current e-cigarette use over time. NHOPI ethnicity (relative to White) at baseline was significantly associated with the factor signifying the increase in e-cigarette exposure over time, which in turn was associated with growth factor indicating increase in e-cigarette use over time. Increase in e-cigarette marketing exposure over time was not associated with cigarette smoking. Filipino ethnicity (relative to White) was inversely associated with increase in e-cigarette marketing exposure whereas Asian ethnicity was not associated with the increase in e-cigarette marketing exposure at all. The association between NHOPI ethnicity and increase in e-cigarette use over time is likely to be explained by increased exposure to e-cigarette marketing over time. Higher exposure to e-cigarette marketing may be associated with disparities in e-cigarette use between NHOPI and other Asians. Tobacco product marketing is likely to target social disadvantaged and marginalized ethnic groups. Counter-marketing efforts may need to target indigenous populations, included NHOPI.

FUNDING: Federal

PH-15

SEXY, TRASHY, COOL: PERCEPTIONS OF CIGARETTES AND E-CIGARETTES ACROSS DEMOGRAPHIC GROUPS

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E-cigarette use is increasing, particularly among young adults, while cigarette use has declined. However, cigarettes are still a top cause of preventable death in the U.S., and e-cigarette use has been associated with cigarette uptake. Rates of cigarette and e-cigarette use are even higher among military personnel, who have a long history of targeting by tobacco companies. Several studies have assessed perceptions and attitudes towards cigarettes and e-cigarettes, but they typically are limited to perceptions of harm. Additionally, studies have not assessed differences in cigarette and e-cigarette attitudes among gender, ethnic, and racial minorities, the latter of whom also have a history of being targeted by tobacco companies. The current study aimed to assess gender (male and female), ethnic (Hispanic and non-Hispanic), and racial (White and non-White) differences in potential positive (e.g., sexy, cool, clean) and negative (e.g., trashy, disgusting) attributes related to cigarettes and e-cigarettes, and their relationship to past 30-day tobacco use. Participants (N=3,374) were young adult (mean age = 20.5) members of the U.S. Air Force who completed a survey about their tobacco use and beliefs. Results indicated that White individuals were more likely to endorse negative attitudes towards cigarettes and positive attitudes towards e-cigarettes compared to non-White individuals (p's<.001). Women were more likely to endorse negative attitudes towards cigarettes and e-cigarettes (p's<.001), while men were more likely to endorse positive attitudes towards cigarettes and e-cigarettes (p's<.001). Differences between Hispanic and non-Hispanic participants were non-significant (p's>.05). Endorsement of either positive or negative e-cigarette or cigarette attitudes was associated with past 30-day use of the corresponding product, controlling for race, age, gender, and ethnicity (p's<.001). Results indicate racial and gender differences in perceptions of cigarettes and e-cigarettes and show the impact of attitudes (negative and positive) on actual use. It may be that exposure to cigarette/e-cigarette messages promotes saliency of products, leading to increased use.

FUNDING: Federal

PH-16

EVOLUTION FROM JOE CAMEL: IMPACT OF TOBACCO MESSAGING AND COMMUNICATION ON TOBACCO USE ACROSS RACE, ETHNICITY, AND GENDER OVER TIME

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Racial minorities have historically been heavily targeted by tobacco companies. Little is known about how individuals from racial minority groups may be differently impacted by tobacco-related messages. In this study, U.S. Air Force trainees, who are racially diverse and also have an extensive history of targeting by tobacco companies, reported demographics, tobacco use, and exposure to positive tobacco messages from social sources (i.e., friends, family, social media) and environmental sources (i.e., advertisements and promotions). Tobacco use was reported one-year later. At baseline, exposure to positive tobacco messaging was examined by race (White, non-White, multiracial), while controlling for other demographics. Multinomial logistic regression models assessed how tobacco messaging exposure and demographic characteristics



influenced tobacco use at one-year follow-up. At baseline, differences in race were found in reported sources of tobacco messaging; although White personnel were more likely to be exposed by friends, family, and environmental sources than other racial groups, multiracial individuals were 1.23 times more likely to receive tobacco messaging from social media compared to White individuals (OR=1.24, p=.051). In final longitudinal multivariate models, non-White participants who were exposed to environmental tobacco messages were more likely to use tobacco products at one-year follow-up (OR=1.5, p=.03) compared to non-White individuals who were not exposed to environmental messages, whereas there was no observed environmental exposure effect observed among White individuals (p > .05). Social sources were not associated with tobacco use at follow-up for any group (p > .05). Increased visibility of tobacco promotions and advertisements among racial minorities in our sample had greater influence on long-term tobacco use compared to White individuals. We will discuss the implications of these findings in the development of tobacco interventions and policies which address exposure to these environmental sources of tobacco messaging among U.S. military young adults, particularly those of racial minorities.

FUNDING: Federal

PH-17

MISPERCEPTIONS OF HARM OF NICOTINE AND REDUCED-NICOTINE CIGARETTES AND HOW TO CORRECT THEM: A QUALITATIVE STUDY

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Significance: Most people incorrectly believe that nicotine is the main cause of tobacco-related diseases. Because of this misperception, the potential reduction of nicotine in combusted tobacco products proposed by the FDA might result in reduced willingness to quit smoking or increased youth initiation. We developed and assessed messages addressing the misperception that reduced-nicotine cigarettes present reduced harm. Methods: Focus groups with adult former smokers (n=32), current exclusive smokers (n=27), dual users (with e-cigarettes, n=25), and young adult non-smokers (n=31) were conducted in Atlanta, GA and San Francisco, CA in 2020. Participants were asked about their perceptions of nicotine and their reactions to 8 messages about reduced nicotine in cigarettes. Results: Participants largely equated harms from cigarettes and harms from nicotine, although a few (mostly with personal experience of smoking) distinguished between the two. Messages listing the harmful chemicals that still remain in cigarettes after nicotine is reduced made participants understand that reduced nicotine cigarettes were still as harmful as regular cigarettes. Mentions of diseases resulting from smoking made it clear that reduced nicotine cigarettes still caused them, but the cigarettes no longer provide craving relief. Some participants questioned why the good part (nicotine) was being removed, but all the other harmful chemicals remain. Conclusions: Messages communicating that reduced nicotine cigarettes are not less harmful and emphasizing the negative outcomes of smoking combusted products have the potential to correct the misperception and increase population-level benefit of the nicotine tobacco product standard considered by the FDA. Messages should also inform why other harmful chemicals are not being reduced, whether something is being added to cigarettes instead of nicotine, and how it is possible to remove nicotine from cigarettes.

FUNDING: Federal

PH-18

SMOKERS' LIKELIHOOD TO ENGAGE WITH MISINFORMATION OF E-CIGARETTE RELATIVE HARMS ON TWITTER: RESULTS FROM A RANDOMIZED CONTROLLED EXPERIMENT

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Background: Misperceptions about the relative harms of e-cigarettes versus smoking cigarettes among smokers are increasing in both the United Kingdom (UK) and the United States (US). This study assessed the effect of smokers' exposure to misinformation about e-cigarette relative harms on Twitter on their likelihood to engage (defined as replying, retweeting, liking, and sharing). Methods: We conducted an online randomized controlled experiment among 2400 UK and US smokers who did not vape in the past 30 days. Participants were randomly assigned to view 4 tweets in one of 4 conditions: 1) E-cigarettes are just as or more harmful than smoking, 2) E-cigarettes are completely harmless, 3) Message expressing uncertainty about e-cigarettes, or 4) Control (physical activity). The outcome measure was overall engagement, comprising the sum of participants' responses of whether they would Reply, Retweet, Like, and Share each tweet. We fitted Poisson regression models predicting engagement, adjusted for covariates for the overall sample and stratified by country. Results: In the full sample analysis, those who viewed Condition 1 (e-cigarettes were as or more harmful than smoking) were more

likely to engage with tweets than Conditions 2 and 3. Those who viewed Condition 4 (physical activity) were more likely to engage with tweets than Conditions 1, 2, and 3. UK participants (vs. US), young age, males, below high school/secondary education, increased social media use, increased daily internet use, and no past e-cigarette use were associated with increased likelihood of engagement. US participants who viewed Condition 1 were more likely to engage with tweets than Conditions 2 and 3. UK participants who viewed Condition 1 were more likely to engage with tweets than Condition 2. Conclusion: Tweets stating misinformation that e-cigarettes were just as harmful or more harmful than smoking may receive more attention than Tweets indicating e-cigarettes were completely harmless. Future research is needed to examine the impact of smokers' engagement with misinformation on their misperceptions of e-cigarette relative harms and to develop strategies to combat the misinformation online.

FUNDING: Nonprofit grant funding entity

PH-19

CORRELATES OF NICOTINE MISPERCEPTIONS AND EFFECTIVENESS OF CORRECTIVE STATEMENTS TO INCREASE UNDERSTANDING OF THE TOBACCO PRODUCT RISK CONTINUUM

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Background: A significant number of Americans do not have an accurate understanding of the relative harm of different tobacco products and incorrectly think that nicotine is the chemical in tobacco products that causes most tobacco-induced disease. Smokers are not generally aware that non-combustible products are less harmful, and are unlikely to switch to a less harmful product as a way to quit combustibles. Understanding the demographic, attitudinal, and behavioral correlates of nicotine misperceptions, as well as what messaging can help to correct them, can inform broader communication campaigns leading to a more well-informed population of smokers. Methods: We conducted two studies: first, we used ordinal logistic regression to analyze a subpopulation of 9013 established adult smokers from the Population Assessment on Tobacco and Health Wave 3 survey to identify correlates of nicotine misperceptions. Misperceptions were measured via the question "Do you believe nicotine is the chemical that causes most of the cancer caused by smoking cigarettes?" Response options were "definitely yes," "probably yes," "probably no," and "definitely no" with "definitely no" being the correct answer. Second, a 2x2 factorial design was used to test the efficacy of nicotine education messages to correct these misperceptions among mTurk participants. Results: Racial minority smoker had higher odds of having misperceptions than non-Hispanic white smokers. Smokers over the age of 45 are also more likely to have misperceptions regarding nicotine. Increased knowledge about diseases caused by smoking was associated with higher odds of having misperceptions, as was worrying more about the health harms of smoking. Exposure to 3 or more antitobacco campaigns was associated with lower odds of having misperceptions. Results from the online experiment are pending. Conclusions: The accuracy of nicotine perceptions are not evenly distributed throughout the population of smokers. Evidence-informed messaging should be used to educate smokers about nicotine and the relative harm of different tobacco products to ensure they have the information to make informed choices about their tobacco use.

FUNDING: Federal; Academic Institution

PH-20

INOCULATING AGAINST THE DISEASE OF MISINFORMATION: NATURAL AMERICAN SPIRIT ADVERTISING

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Advertising about tobacco products has produced a long history of misinformation about tobacco and its consequences for consumers. This misinformation calls out for correction through regulatory action and through communication campaigns to counter false and misleading beliefs. This presentation will describe approaches to messaging in service of correcting false beliefs and their emotional residue (belief echoes). The approaches considered include (1) simple correction of the misinformation (education) while avoiding repetition of the falsehood; (2) inoculation of targeted audiences in advance against specific appeals; (3) the use of narrative appeals (and testimonial examples) to reframe the misinformation in an alternative (causal) mental model; (4) value affirmation to motivate action and reduce barriers to receipt of threatening information; (5) emotional appeals to counteract residual affect from misinformation; (6) moral appeals especially ones activating moral outrage by citing self-interested deception. This overview will cite key research studies relevant to tobacco products in which each corrective strategy has been successfully deployed including some recent published and unpublished work from our TCORS projects. In addition to an illustrative study, the conditions under which



each approach might be best applied will be discussed. For example, emotional appeals must be explicitly tied to the misinformation being corrected or the utility of emotional invocation will be less relevant to belief correction. Combinations of approaches will also be mentioned to describe when two or more elements can work together to enhance the impact on correction. For example, narrative and inoculation can provide engaging messages that forewarn and forearm young people about the addictive character of ENDS products. Although no single approach to correcting misinformation is fully effective in all contexts, understanding the alternatives and their conditions of application, alone and together, can enhance researchers' and regulators' tool box of interventions.

FUNDING: Federal

PH-21

EXPLORING THE IMPACT OF COVID-19 ON TOBACCO USE AND CESSATION BEHAVIORS AMONG TRANSGENDER AND GENDER EXPANSIVE ADULTS

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Significance: There is limited research on the impact of the COVID-19 pandemic on tobacco use among transgender and gender expansive (TGE) persons who are disproportionately impacted by the pandemic and tobacco use. This study explores changes in cigarette smoking in relation to the pandemic among TGE adults in the US. **Methods:** Between March and April 2020 (during COVID-19 restrictions in the US), we enrolled 14 TGE adults ages 18+ who are current cigarette smokers through Facebook and Instagram advertising. This was part of an ongoing study of risk and protective factors of smoking behaviors among TGE individuals. Participants completed a baseline survey and were assigned to a private Facebook or Instagram group to share pictures and captions of smoking risks and protective factors daily for 21 days. They then completed a follow-up survey and a focus group discussion. We categorized the risks and protective factors related to COVID-19 based on the daily pictures and focus group discussion data. **Results:** The main risk factors of continued or increased smoking associated with the pandemic included stress of sheltering in place with family members, experiencing gender-based discrimination such as verbal cruelty from persons who were not gender-affirming, and awkward conversations and the inability avoid these situations. Participants reported exacerbation of other smoking risk factors during the pandemic including economic and housing insecurity, lack of access to COVID-19 testing and healthcare, and lack of access to affirmative healthcare. The main protective factors of reduced smoking or quitting attempts during the pandemic were difficulty to purchase cigarettes and concern for their physical health. **Conclusion:** This study provides a real-time snapshot on the impact of the COVID-19 pandemic on TGE individuals' smoking behaviors based on qualitative data collected during the early months of the pandemic. The pandemic and resulting social distancing restrictions were associated with triggering smoking behaviors among some participants while prompting some participants to reduce smoking or attempt to quit smoking.

FUNDING: Federal

PH-22

CIGAR AND BLUNT SMOKING AMONG BLACK YOUNG ADULTS IN THE TIME OF COVID-19

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INTRODUCTION Black Americans bear a disproportionate burden of poor health outcomes across the lifespan. Mirroring other health inequalities, Black Americans have suffered high mortality rates during the coronavirus 2019 (COVID-19) pandemic. However, little is known about the influence of this pandemic on tobacco or marijuana use among Black young adults. **METHODS** Forty in-depth telephone interviews were conducted between May and July 2020 to investigate cigar (i.e., large cigars, cigarillos, and filtered cigars) and blunt smoking behaviors during the pandemic among non-Hispanic Black young adult cigar smokers (n=40; ages 21-29). Interviews were audio-recorded, transcribed verbatim, and coded separately by three coders. Thematic analysis was used to assess patterns of themes and subthemes arising from the interviews. **RESULTS** Many participants smoked cigarillos and blunts more frequently and in higher numbers to cope with stress, anxiety, loneliness, and boredom associated with pandemic-related

unemployment, loss of income, change in daily routine, and physical isolation. Some smoked fewer large cigars due to the closing of cigar lounges and social distancing from cigar-smoking companions. Most participants thought their risks of contracting the coronavirus were similar to the general public as long as they took precautions (e.g., wearing masks). Those who had higher perceived risks did not have increased motivation to quit cigars. Reduced income did not prompt reduced spending on cigarillos due to their affordability. Very few had difficulty purchasing their regular cigarillo brands or flavors, since essential businesses are open and often sell cigarillos. Some tried to ration marijuana by mixing in more tobacco when smoking blunts. **DISCUSSION** Black young adults are at risk of smoking more cigarillos and blunts during the pandemic, which may translate to increased chronic diseases and associated health disparities. As the pandemic continues, public health practitioners need to communicate with this group about healthy strategies for coping with the pandemic and promote cigar and blunt smoking cessation in a contextually and culturally appropriate manner.

FUNDING: Federal

PH-23

HEALTH AND SUBSTANCE USE PATTERNS DURING THE COVID-19 PANDEMIC IN UNSHELTERED AND UNSTABLY HOUSED WOMEN

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BACKGROUND: The psychosocial dynamics of the COVID-19 pandemic are beginning to emerge. However, factors specific to homeless and unsheltered people, who have higher rates of pre-existing comorbidities but fewer options for social distancing, are not yet established. We are in the process of conducting a "rapid response" study to understand influences of the COVID-19 pandemic on substance use and the health of unsheltered and unstably housed women living in San Francisco. **METHODS:** We are conducting a sub-study within a recently completed research program on the cardiovascular health of unstably housed women living with or at risk for HIV. Phone interviews with 150 women recruited from San Francisco homeless shelters, free meal programs, low-income hotels and street encampments are assessing social disruptions (e.g., housing and food insecurity), mental health and the use of tobacco as well as other substances since mid-March, when shelter in place (SIP) policies were established. **RESULTS:** While we will provide a more comprehensive report during the symposium, we have already identified several important issues from our preliminary analyses. In particular, social isolation and symptoms of anxiety are common and more pronounced since mid-March. Also during this period, participants report increased substance use, including the use of tobacco (36% increase), alcohol (36% increase), cannabis (45% increase) and cocaine (44% increase). **CONCLUSIONS:** Our early data suggest a need to address increased social isolation and anxiety during the pandemic [while SIP policies are necessary] in unsheltered and unstably housed women, a population already at high risk for substance use and psychiatric comorbidity. Given prior research linking anxiety to tobacco, alcohol, cannabis and cocaine use, such increased efforts may have the dual benefit of improving mental health and reducing the use of substances – including tobacco – in this population.

FUNDING: Federal; State

PH-24

CHANGES IN YOUTH AND YOUNG ADULT E-CIGARETTE USE IN RESPONSE TO THE EMERGENCE OF COVID-19

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Background. The public health response to the emergence of novel coronavirus, or COVID-19, has included ongoing "stay-at-home" or "shelter in place" orders in communities across the United States. The effects of resulting changes in the social environment has affected e-cigarette access and use among youth and young adults are unknown. **Methods.** Data were drawn from a nationally representative cross-sectional weekly tracking survey of youth (aged 15-17) and young adults (aged 18-24) from January 1, 2020 – June 29, 2020. An interrupted time series design was used to assess changes in prevalence of current (past 30-day) e-cigarette use among youth and young adults (N=5,752) following widespread adoption of stay-at-home orders in communities across the United States (March 14 2020). Multivariable logistic regression analyses were conducted among current vape users (n=774) to determine factors driving changes in e-cigarette use during the COVID-19 pandemic and explain observed variations by



age. Results. Month-level vape use prevalence decreased immediately following the implementation of stay-at-home orders in mid-March 2020, from 32.0% (February 2020) to 26.8% (April 2020) with continued declines through the end of the study period (June 2020: 23.8%). Odds of vape use was significantly lower among youth aged 15-17 (OR: 0.49, $p < 0.001$) and young adults aged 18-20 (OR: 0.85, $p < 0.05$) compared to young adults age 21 and older. In multivariable models, decreased vape sharing (OR: 1.82, $p < 0.001$) and change in access to consumer goods (OR: 1.49, $p < 0.05$) was associated with self-reported reduction in e-cigarette use, controlling for number of days of e-cigarette use in the past month, age and other demographic characteristics. Conclusions. The COVID-19 pandemic presents barriers to access to e-cigarettes through social and retail sources, particularly for respondents under age 21. Findings have implications for the development of targeted tobacco prevention and cessation efforts.

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PH-25

EFFECT OF THE COVID-19 PANDEMIC ON PERCEIVED RISK, ATTITUDES AND BEHAVIOR AMONG CIGARETTE SMOKERS AND NICOTINE VAPERS IN MEDICATION-ASSISTED TREATMENT FOR OPIOID USE DISORDER

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Significance: Cigarette smoking may increase the risk of progression to severe COVID-19 infection, reinforcing the urgency of smoking cessation, especially in populations with high smoking prevalence such as individuals with opioid use disorder (OUD). Whether the COVID-19 pandemic has altered risk perceptions, motivation to quit, or tobacco product use among cigarette smokers and nicotine e-cigarette users (nicotine vapers) with OUD is unknown. Methods: We conducted a phone survey of patients with OUD in buprenorphine (bup) maintenance treatment at 5 Boston-area community health centers from February-July 2020 (N=221; 42% response rate). In March 2020, we added questions for smokers and vapers on perceived risk of COVID-19 due to smoking or vaping, interest in quitting, recent tobacco use, and quit attempts. Results: 144 smokers and vapers answered the COVID-19 questions (53% male, 80% White, mean age=45 years, mean length of bup treatment=3 years, mean bup dose=18mg). 87% were current smokers and 39% were current nicotine vapers (61% smoked only, 13% vaped nicotine only, and 26% were dual users). Three-quarters of smokers and vapers believed that smoking or vaping increased their risk of contracting COVID-19 or having a more severe case. Smokers with this belief had an increased interest in quitting (AOR 4.3, 95%CI: 1.6-11.5). Half of smokers said that the COVID-19 pandemic had increased their interest in quitting, 20% reported decreasing cigarette consumption, and 23% reported making a quit attempt; however, 35% reported increasing cigarette consumption. Among vapers, 42% reported an increase in quit interest, 20% reported making a quit attempt and 16% decreased the amount vaped. Conclusions: Most patients in OUD treatment who smoke or vape nicotine feel that these behaviors increase their risk of COVID-19. While many smokers reported more interest in quitting and some attempted to quit, one-third increased their smoking during the pandemic. The COVID-19 pandemic appears to have mixed effects on tobacco use by smokers and vapers with OUD. Tobacco treatment programs may need tailoring to address psychiatric, social, and other stressors caused by the pandemic.

FUNDING: Federal

PH-26

TOBACCO RETAIL OUTLET E-CIGARETTE MARKETING IMPACTS E-CIGARETTE INITIATION THROUGH SOCIAL ACCEPTABILITY BELIEFS

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Introduction: The purpose of this study was to examine the impact of both self-reported and objectively measured exposure to ENDS marketing in tobacco retail outlets (TROs) on important mediators and ENDS initiation among young adults. Methods: Participants were 2010 students (67.5% female; 34.8% white; m age=20.2) from 24 2- and 4-year colleges in Texas participating in seven waves of a longitudinal study (2014-2018) who had not initiated ENDS use through wave 3 and had data from at least one wave. The outcome was ENDS initiation after wave 3 (14.7% initiated). Point-of-sale ENDS marketing exposure at TROs at wave 2 (spring, 2015) was assessed two ways: 1) index of

objective counts of ENDS marketing at TROs within a mile of each college multiplied by each student's weekly store visit frequency and 2) self-reported item which assessed how often students saw signs marketing ENDS when they visited TROs (1=never to 4=every time). Mediators were assessed at wave 3 (fall 2015) with one self-reported item each: ENDS social acceptability, perceived addictiveness, and perceived harmfulness. Path analyses, with colleges as the cluster variable and controlling for baseline sex, age, race/ethnicity, and college type (4- vs 2-year), were used to examine the associations between ENDS marketing, the mediators, and ENDS initiation. Results: Self-reported and objectively measured exposure to ENDS marketing at TROs each predicted social acceptability of ENDS six months later ($\beta = 0.23$, $p < .001$; $\beta = 0.06$, $p < .001$, respectively). Social acceptability then predicted ENDS initiation ($\beta = 0.11$, $p < .001$, $\beta = 0.12$, $p < .001$, subjective and objective exposure respectively). The indirect effect was significant in both models ($\beta = .03$, $p < .001$; $\beta = .01$, $p = .002$, subjective and objective exposure respectively). Exposure to ENDS marketing did not predict perceived addictiveness or harmfulness of ENDS, and neither predicted ENDS use. Conclusions: ENDS marketing at TROs works to create beliefs about the social acceptability of ENDS use, which then increase the likelihood of initiation of ENDS use among young adults. Policy approaches that seek to limit the prevalence of ENDS marketing at TROs are needed.

FUNDING: Federal

PH-27

ATTITUDES TOWARD TOBACCO MARKETING MEDIATE THE RELATION BETWEEN MARKETING EXPOSURE AND USE AT FOLLOW-UP

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Background: A growing body of evidence indicates that exposure to tobacco marketing among adolescents increases the likelihood of subsequent tobacco initiation. It is important to understand the process by which this occurs, in order to appropriately target factors for intervention. Unpacking the process requires precise methodology and long-term follow-up. The purpose of this study was to pair ecological momentary assessment (EMA) and a prospective cohort study in order to examine mediators of tobacco marketing exposure on adolescent tobacco use. Methods: From an ongoing prospective cohort study of male youth (N=1220; aged 11-16 at baseline), we recruited a subset of tobacco users and non-users to participate in an additional EMA project (N=164). For the main cohort study, youth completed surveys every 6 months about their current tobacco use. For the EMA, youth completed smartphone-based surveys 2-3 times/day over a 10-day period with items assessing their exposures and attitudes towards tobacco-related advertising. If participants reported exposure to tobacco advertising, they were asked how much they enjoyed it, liked it, and found it appealing; these three item averages were then aggregated, within participants, to form a single "average attitude" score. Results: Analyses indicated that youth who reported a greater amount of marketing exposure during the EMA period were more likely to report past-30-day tobacco use at their next cohort follow-up (6-12 months later). This effect remained after controlling for baseline tobacco use. Moreover, the impact of marketing exposure on subsequent use was partly mediated by attitudes toward the tobacco advertisements, as reported during the EMA. Follow-up analyses revealed differences by tobacco use trajectories. Conclusions: Overall, EMA reports provided a snapshot of a youth's dosage of tobacco marketing exposure, and responses to those exposures. Findings indicate the pernicious and long-lasting impact of tobacco marketing exposure on youth. Interventions to lessen youths' positive attitudes toward tobacco advertisements may help disrupt this impact.

FUNDING: Federal

PH-29

COMBINING THE STRENGTHS OF PROBABILITY AND NONPROBABILITY ONLINE SAMPLES TO CONSTRUCT A NATIONAL TRACKER OF YOUTH AND YOUNG ADULT TOBACCO USE

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The rise in popularity of online data collection warrants research on the extent to which online panel respondents differ on behavioral, attitudinal, or social attributes compared to respondents to other modes of data collection. Research is also needed to compare probability-based and convenience online panel samples. To determine robustness of ongoing rapid response tobacco control research using an online convenience sample, ten items were selected as calibration measures for inclusion during a period of simultaneous fielding of two online surveys on tobacco-related outcomes among youth and



young adults (age 15-24): the Truth Media Monitoring Survey (MM), a continuous tracking survey drawn weekly from a cross-sectional national online panel (n=220/week, annual N>11,000); and the Truth Longitudinal Cohort (TLC), a semi-annual probability-based, nationally representative cohort survey (N=14,058). Calibration items were selected if external benchmarks from nationally representative probability-based household samples existed and they provide an indicator of: home environment; online behavior; or social participation. The calibration method weights only the probability portion of the sample according to U.S. Census demographic benchmarks (Step 1) and combines the weighted probability sample with the unweighted opt-in sample (Step 2). Preliminary data suggest that anti-tobacco attitudes are correlated between the surveys. For example, 50.9% (TLC) and 47.7% (MM) of respondents agreed/strongly agreed that tobacco companies made them angry (p<0.001); 50.1% (TLC) and 49.2% (MM) of respondents agreed/strongly agreed that not smoking makes them feel powerful (p<0.001). Additional tobacco-related and calibration responses are compared descriptively and using bivariate statistics between the probability sample (from Step 1) and the combined sample (from Step 2), and to national benchmark studies. Findings and recommendations will inform the selection of appropriate, cost-effective data collection methods for population-based studies of youth and young adult tobacco use.

FUNDING: Unfunded

PH-30

THE TEXAS ADOLESCENT TOBACCO MARKETING AND SURVEILLANCE SYSTEM (TATAMS): A "RAPID-RESPONSE" APPROACH TO MEASURING E-CIGARETTE AND OTHER TOBACCO USE AMONG YOUNG PEOPLE

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Significance: Over the last decade, the tobacco product marketplace has undergone quick, dramatic changes in regards to the types of tobacco products that are sold and advertised. This is especially pertinent to e-cigarettes, the use of which has risen exponentially among young people. Attempts to monitor use and related risk factors are challenged by this ever-evolving environment. Methods: The Texas Adolescent Tobacco Marketing and Surveillance System (TATAMS) was established in 2014, as part of the Texas Tobacco Center of Regulatory Science (Texas TCORS). As a multiple-component system, it included (a) student surveys; (b) in-person audits of point-of-sale advertising surrounding schools; and (c) analyses of Nielsen's Convenience Track data on tobacco sales. TATAMS used a complex, multi-stage, probability sampling design to recruit and enroll participants (n=3,907; N=461,069), who were in the 6th, 8th, and 10th grades at baseline. Students attended middle schools and high schools (n=79; N=1,969) in the largest metropolitan areas of Texas (Houston, Dallas-Ft. Worth, San Antonio, Austin). Results: In 2014, students participated in a web-based survey in school about their e-cigarette and other tobacco product use, administered via tablets. Every 6 months since, participants have been invited to take the web-based survey outside of school on their tablet, computer, or smartphone. Each wave, the 500+ item instrument is updated to reflect changes in the tobacco product marketplace. Retention ranges 63-85%, to date. Data collection continues into 2021, when participants will be 1, 3, and 5 years post-high school. Examples of how our surveillance system has adapted to this changing environment will be presented, along with illustrations of how these unique data have informed the state-of-the-science in tobacco prevention and control. Conclusions: TATAMS is a successful "rapid-response" surveillance system. It is possible to design, collect, and communicate information about young people's e-cigarette and other tobacco use behaviors at a relatively low budget and in a timely fashion.

FUNDING: Federal

PH-31

PREVALENCE OF YOUNG ADULT VAPING, SUBSTANCE VAPED, AND PURCHASE LOCATION ACROSS 5 VAPING DEVICES

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Background: Despite the vast array of vaping device types on the market, it is not clear how vaping patterns vary across different device types. This study describes the prevalence of use, substances vaped, and purchasing behaviors across five different vaping devices among a cohort of young adults in Southern California. Methods: Participants aged 18-20 years (n=2505) completed web-based surveys from June 2018-October 2019. For each of five devices depicted via digital images (JUUL, pod

vape [e.g., Suorin], cigalike, box-mod, vape pen), participants reported ever and past 30-day use, substance vaped (only nicotine, only THC, both nicotine and THC, neither nicotine nor THC), whether they owned that device (yes/no), where they obtained that device (e.g., purchased themselves, from a friend), and if purchased, where they had bought it (e.g., vape shop, online). Results: Past 30-day use was highest for pod vapes (17.0%), followed by JUUL (15.1%), and the lowest for cigalikes (2.3%). Approximately half (48.9%) of ever pod vape users and 46.0% of ever JUUL users were also past 30-day users. JUUL, pod vapes, cigalikes, and box-mods were most often used to vape nicotine, while vape pens were more often used to vape THC. Among respondents who reported ever owning a device (n=643), 59.9% reported purchasing the device themselves, despite not being of legal purchasing age in the state of California; vape shops and online were the most common purchase locations across all device types. Conclusions: Young adult vaping patterns vary across different device types. Findings suggest that prevention and health communication efforts on vaping should include THC and not just nicotine. The high proportion of underage young adults (i.e., younger than 21 years) who reported having purchased their own vaping device from a vape shop or online suggests that stronger tobacco control policies and better enforcement efforts are needed to successfully prevent underage purchase of tobacco products.

FUNDING: Federal; State

PH-32

THE ASSOCIATION OF FIRST E-CIGARETTE DEVICE USED AND FIRST FLAVOR USED WITH DEVELOPMENT OF NICOTINE DEPENDENCE

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Introduction: Different types of e-cigarette devices deliver nicotine with varying efficacy, suggesting the potential for some devices to carry a greater risk for development of nicotine dependence at the same level of use. We investigated the association of device type and flavor with nicotine dependence among youth and young adults. Methods: Participants in a California prospective cohort study (H&H) completed survey items for the most recent wave (Oct. 2018-June 2019) on e-cigarette use (number of days in past 30) and characteristics (e.g., device used first, type of device used most frequently, flavor used first, and flavor used most frequently). Nicotine dependence was collected using the Hooked on Nicotine Checklist (cigarettes) and adapted measures for e-cigarettes and JUUL; participants were categorized as having any nicotine dependence if they reported one or more symptoms on any scale. Multivariate logistic regression models evaluated the association of each e-cigarette exposure variable with any nicotine dependence, adjusting for covariates. A meta-analysis including data from three additional studies in California and Connecticut (Total N~10,000) will also be presented. Results: Overall, 26.7% (N=284) of H&H participants who had ever vaped (N=1064) reported any nicotine dependence. Among those reporting any symptoms, the mean number of symptoms was 4.19 (SD=2.82). Number of days of e-cigarette, JUUL, or other vape use was associated with dependence, with each additional day of using conferring a 7-10% increase in odds of any dependence (ps<0.05). Having first used a box mod, other mod, or other pod device (vs. JUUL) or use a pod device most frequently in the past month (vs. JUUL) was associated with 2-3 times the odds of dependence (ps<0.05). Use of menthol/mint as a first flavor or most frequently used flavor (vs. sweet flavor) was also associated with 1.6-2.3 times the odds of dependence (ps<0.05). Conclusions: Certain attributes of e-cigarettes, including device type and flavor, increase the risk for nicotine dependence, suggesting key targets for regulatory policies to reduce the adverse effects of youth e-cigarette use.

FUNDING: Federal; State

PH-33

E-CIGARETTE DEVICE TYPE AND COMBUSTIBLE TOBACCO USE: RESULTS FROM A POOLED ANALYSIS OF 10,482 YOUTH

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Introduction: Youth are using a wide variety of e-cigarette devices with different attributes (e.g., nicotine formulation, disposables vs. pods). Less known is the association between e-cigarette device type and combustible tobacco product use. Methods: We used data



from 4 cohorts of youth (N=10,482; ages 13-21) from Connecticut and California to evaluate the association between e-cigarette device type and combustible tobacco product use in the past month. Multivariable logistic regression analyses were conducted for each cohort controlling for school, age, gender, race/ethnicity, socioeconomic status, and past-30-day use of marijuana. We then conducted meta-regression analysis to calculate the pooled effects across cohorts. Results: Combustible tobacco product use (i.e., cigarettes, cigarillos, cigars, hookah) among past-month e-cigarette users ranged across cohorts from 15.8% to 61.5%. Pooled effects indicate that using disposables (AOR 2.83; 95% CI: 1.73, 4.61) and multiple devices (AOR 2.13; 95% CI: 1.16, 3.9) most frequently in the past month (vs. pods) was associated with greater odds of past month combustible tobacco product use. Using multiple e-cigarette devices relative to using a single device in the past month (AOR 2.13; 95% CI: 1.16, 3.9) was also associated with greater odds of past-month combustible tobacco product use (AOR 2.33; 95% CI: 1.74, 3.14). Discussion: Using disposable e-cigarettes and multiple devices may increase the risk of combustible tobacco product use among youth. Future research should elucidate the trajectory of e-cigarette device type used and combustible tobacco product use patterns among youth to inform product regulation.

FUNDING: Federal

PH-34

ASSOCIATION OF VAPING EXPECTANCIES AND E-CIGARETTE DEVICE TYPE IN ADOLESCENT E-CIGARETTE USERS

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Significance: Adolescents use a number of e-cigarette devices (e.g. vape pens, mods) which vary in product characteristics (e.g., shape, size, amount of vapor produced). Among past-month adult e-cigarette users, vaping expectancies, which include expected effects of vaping related to positive reinforcement (e.g., enjoying taste), negative reinforcement (e.g., coping with negative affect), weight control (e.g., vaping for weight loss), and negative consequences (e.g., health risks) have been shown to be associated with increased past month vaping and e-cigarette dependence. Given vaping expectancies association with e-cig behaviors, the aim of the current study was to examine if vaping expectancies were associated with adolescent vaping behaviors, such as e-cigarette device use. Methods: We examined evidence collected at baseline among 49 adolescent e-cigarette users [63.3% male, 18.7(SD=0.9) years, 65.3% non-Hispanic White and used e-cigarettes on 26.2(SD=3.6) days in past month] who were participating in an experimental e-cigarette exposure study. We assessed vaping expectancies using The Short Form Vaping Consequences Questionnaire and past month use of the following e-cigarette devices: (1) disposables, cig-a-likes, (2) hookah-pens/vape-pens (3) JUUL, and (4) mods. We utilized 4 linear regression models (one for each expectancy: positive reinforcement, negative reinforcement, weight control, negative consequences) to examine whether expectancies differed by device type. Sex was a covariate in all models. Results: After controlling for sex and use of other devices, those who used hookah-pens/vape-pens in the past 30 days had stronger expectancies for appetite/weight control than those who did not. Those who used Mods in the past month had weaker expectancies for negative consequences than those who did not (p<0.01). Conclusions: Use of various e-cigarette device types in regular adolescent e-cigarette users appears to be related to their vaping expectancies. E-cigarette campaigns aimed at reducing youth vaping may benefit from an e-cigarette device type-specific approach when addressing youths' vaping expectancies.

FUNDING: Federal; State

PH-35

YOUTH USE OF E-CIGARETTES: DOES DEPENDENCE VARY BY DEVICE TYPE?

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Significance: The number of youth aged 13-18 in the US who use electronic cigarettes (e-cigarettes) continues to increase, with estimates at 5.4 million in 2019. Recent research suggest that new nicotine salt-based e-liquids may allow for easier and more intense inhalation of high concentrations of nicotine. As such, there is concern that newer types of e-cigarettes may inadvertently establish a new generation of youth addicted to nicotine. Therefore, this study examined the influence of e-cigarette device type on nicotine dependence, accounting for relevant covariates, in a convenience sample of youth users in the United States. Methods: Current youth users of e-cigarettes completed measures of demographic characteristics, e-cigarette use, other tobacco products used, e-cigarette device type, and dependence (Hooked on Nicotine Checklist; HONC) via an online panel survey from April 2019 to May 2019. Results: Youth (n=147) were primarily female (73.5%), mostly white/Caucasian (39.5%) or multiracial (35.4%), and high school students (89.1%). Participants endorsed an average of 4.6 / 10 items on the HONC checklist (SD=3.6). In total, 8/10 items on the HONC significantly differed across device types, such that JUUL and pod-mod users had a higher frequency of endorsement of those items (e.g., indicated "yes" to items like "Have you ever felt like you were addicted to your e-cigarette?"). Users of JUUL and pod-mod devices endorsed significantly greater nicotine dependence, even when adjusting for frequency of e-cigarette use and current smoking status (JUUL IRR = 2.13, 95% CI 1.35-3.36; other pod-mod device IRR = 1.95, 95% CI 1.14-3.33). E-cigarette use frequency (i.e., daily, weekly, monthly) on number of endorsed HONC items was not significant; however, current smoking status was significantly associated with a higher number of endorsed HONC items (IRR = 1.52, 95% CI 1.01-2.27). Conclusions: Nicotine dependence was higher among JUUL and pod-mod users compared to other e-cigarette users. Features of nicotine dependence experienced by youth (i.e., feeling a stronger urge to vape, finding it hard to concentrate without vaping) may differ by primary device used.

FUNDING: Federal; State

PH-36

A PARADIGM SHIFT: POINT-OF-CARE SMOKING CESSATION INCREASES REACH, EFFECTIVENESS, AND SUSTAINABILITY WITH THE COVID-19 PANDEMIC

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Smoking has negative effects on cancer outcomes but is often unaddressed in cancer care. This study examines reach, effectiveness, and sustainability of Electronic Health Record-Enabled Evidence-Based Smoking Cessation Treatment (ELEVATE) at a large Cancer Center with two comparisons: a) pre-post comparison of ELEVATE, and b) ELEVATE versus usual care. Effectiveness is defined by smoking cessation assessed from self-reported smoking status at the last outpatient encounter during the subsequent 6 months. Pre/post and Quasi-experimental comparisons assessed reach, effectiveness, and sustainability related to ELEVATE implemented in 6/2018 in 33,527 patients including 3,968 smokers. The proportion of smokers receiving treatment increased from pre- to post-ELEVATE (1.6% to 27.5%, RR=16.4 [9.5, 28.2]). At post-implementation, reach was significantly higher in ELEVATE versus usual care (27.5% vs. 11.8%, RR=2.3 [1.8, 2.9]). The proportion of smokers who subsequently self-reported cessation increased significantly from pre- to post-ELEVATE (12.0% vs. 17.1%, RR=1.4 [1.1, 1.7]), and was higher in ELEVATE vs. usual care clinics (17.1% vs 9.9%, RR=1.2 [1.1, 1.3], p<0.001). Treatment reach fluctuated during the post-implementation periods of 1-6 months, 7-12 months, 13-18 months, and 19-24 months (28%, 42%, 32%, 37%, p<0.0001. Effectiveness fluctuated at 1-6 months, 7-12 months, and 13-18 months (17%, 19%, and 14%, p<0.0001). Reach increased from 13-18 between 1-6/2020 during the COVID-19 pandemic (32% to 37%, p=0.0012). There was a reduction in effectiveness from 7-12 months to 13-18 months post implementation (17% to 14%, p<0.0001). A low-burden point of care treatment model led to pre-post increases in reach and effectiveness. Further, both reach and effectiveness with this point of care model leveraging EHR functionalities and learning health system strategies shows moderate to high sustainability over time including during the COVID-19 pandemic, when medical encounters occur in person or virtually. Future research should use experimental designs that increase strength of inference.

FUNDING: Federal; Academic Institution



PH-37

OPTIMIZING CLINIC WORKFLOW TO INCREASE REACH OF CESSATION TREATMENT AMONG CANCER SURVIVORS

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Tobacco use after a cancer diagnosis has negative effects; yet, use of tobacco cessation is suboptimal in oncology settings. As part of the NCI Cancer Center Cessation Initiative (C3I), University of Virginia (UVA) Cancer Center completed a quality improvement study to increase the reach of an existing Tobacco Treatment Program (TTP). Using Lean Methodology, the study identified and prioritized gaps in existing procedures for assessing and documenting tobacco use among cancer survivors and referral to the TTP using process mapping, shadowing, and stakeholder feedback. Process mapping revealed 20 gaps: 45% (n=9) were electronic health record (EHR) gaps, 45% (n=9) were cancer center gaps, and 10% (n=2) were clinician-related gaps. Inconsistent documentation of tobacco use status was identified as the top priority, as it directly impacted downstream gaps. Process mapping also showed that multiple clinical team members assessed/document tobacco use, resulting in a fragmented referral system. Optimization focused on increasing efficiency. For example, the rooming nurse was found to be able to consistently assess/document tobacco use and begin conversations about the TTP. A triaging system was refined, stratifying patients into 3 tiers based on clinical urgency and patient readiness to quit smoking. Tiers determined how Tobacco Treatment Specialists were notified about new patients. Prior to the implementation of triaging improvements, 43% of survivors were referred as "medically urgent", mostly when cessation was ordered by the surgical oncologist in preparation for treatment. By the end of the C3I, the reach of the TTP included a larger proportion of "non-urgent" referrals, with urgent referrals now comprising 19% of survivors. In addition, the creation of better EHR charting processes reduced the documentation time and increased time available for cessation interventions. By increasing efficiency, reach increased from 284 survivors in Year 1 to 487 by Year 3. The new TTP provides a consistent, personalized, and sustainable comprehensive cessation program optimized within the workflow of the UVA Cancer Center to reduce tobacco use and improve cancer outcomes.

FUNDING: Federal

PH-38

A NOVEL POPULATION HEALTH STRATEGY TO REACH UNASSISTED CANCER PATIENTS WHO SMOKE

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Background: Tobacco treatment in cancer care is difficult to implement with the complexities of cancer care given multiple providers and treatments. The University of California Davis Comprehensive Cancer Center (UCDCCC) was funded to integrate tobacco treatment into cancer care, as part of the National Cancer Institute Cancer Center Cessation Initiative. Although UCDCCC providers received tobacco treatment training, many patients still did not have documented assistance. This study describes how the UCDCCC implemented a population health strategy to address this gap. Methods: Cancer patients who smoke were identified in a report of patients with a cancer clinic encounter from January–June 2019, using electronic health record data, and contacted by the UCDCCC team in November–December 2019. The report includes fields for smoking status and orders for medications or referrals to tobacco treatment programs (TTP: quitline, group class). Patients who were contacted received brief advice to quit and were offered TTP referrals. Outcomes include reach, defined as the proportion of patients who had TTP referrals or medication orders (treatment reach) or documented tobacco treatment assistance (overall reach), and effectiveness of TTP services, defined as past-month abstinence at 6-month follow-up. Results: The treatment reach with clinic providers from January–June was 31% (164 of 526 patients). Among the 362 unassisted patients, the UCDCCC team contacted 176 patients (14 deceased) and assisted 52 with TTP referrals (15 group class, 37 quitline), increasing the treatment reach to 41%, and advised 110 patients, improving overall reach to 62%. Among the unassisted patients who agreed to TTP assistance, 38% engaged in TTP services (6 out of 15 group class, 14 out of 37 quitline). Of those who engaged in TTP services, 30% (n=6/20) reported past-month abstinence at 6-month follow-up. Conclusion: The population health strategy increased treatment reach with TTP referrals and doubled the overall reach of documented assistance. Patients referred to TTP through this strategy had engagement and effectiveness outcomes similar to reports for provider-based referrals.

FUNDING: Federal; Academic Institution

PH-39

USING ASK-ADVISE-CONNECT TO REACH CANCER PATIENTS WHO SMOKE AT THE HUNTSMAN CANCER INSTITUTE

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Continued tobacco use after cancer diagnosis has been found to negatively influence cancer treatment outcomes, decrease patients' quality of life, and reduce patients' survival. The Tobacco Cessation Program at Huntsman Cancer Institute (HCI) was established in the fall of 2017 to serve the tobacco cessation needs of cancer patients who use tobacco. The program uses Ask-Advise-Connect (AAC), an evidence-based, health technology approach, to engage cancer patients who use tobacco in cessation intervention. AAC is integrated into HCI's electronic health record (EHR) system such that all cancer patients are assessed for tobacco status (Ask). When working with patients who have been identified as tobacco users, providers will receive a best practice alert (BPA) that requires them to advise their patients to quit (Advise), and, with patients' permission, send patients' contact information directly to the tobacco cessation program (Connect). Patients received tobacco cessation interventions that include pharmacotherapy, behavior therapy, and motivational interviewing. This presentation will 1) report implementation outcomes (e.g., assessment rate, advise rate, and connect rate) from the version of AAC, 2) discuss challenges the program encountered in initial implementation, 3) delineate program's effort to adapt and enhance AAC to address implementation challenges, 4) report outcomes after revised procedures for AAC were implemented, and discuss lesson learned in reaching and providing tobacco cessation interventions to cancer patients.

FUNDING: Federal; Academic Institution

PH-40

EARLY EVIDENCE OF THE EFFECTIVENESS OF A MASS MEDIA CAMPAIGN TO REDUCE E-CIGARETTE USE AMONG YOUTH AND YOUNG ADULTS

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To evaluate the early effectiveness of a national mass media campaign to influence e-cigarette-related knowledge, attitudes and beliefs in a social environment where e-cigarette use is increasing. A national sample of respondents aged 15-24 years (n=8,421) was drawn from a repeated cross-sectional online panel survey of approximately 240 participants per week following the launch of the truth® anti-e-cigarette campaign in October 2018. Campaign exposure was measured by self-reported ad recall aided by a collage. Outcomes were agreement with facts about e-cigarettes presented in the campaign (knowledge) and attitudes about e-cigarette product harm, social unacceptability, "unappeal," and anti-industry sentiments. Covariates include respondent demographics, sensation-seeking score, mental health status, current or ever e-cigarette use, and growth in e-cigarette sales. Knowledge of e-cigarette facts was significantly higher among respondents reporting low and high frequency of truth anti-e-cigarette ad exposure compared those who reported never seeing an ad (p<0.05). High frequency of exposure to truth anti-e-cigarette ads was associated with significantly higher scores on a scale of e-cigarette-related attitudes (the Anti-Vape Scale, or AVS) (p<0.05), as well as AVS subscales for perceived product harm (p<0.05), social unacceptability (p<0.05), and anti-industry attitudes about e-cigarette companies (p<0.05). Mass media campaigns can change beliefs and attitudes about e-cigarette use among youth and young adults, even during a phase of growth in e-cigarette sales and popularity among young people. Future campaign evaluation priorities include measuring the longer-term campaign effects on e-cigarette use behaviors.

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PH-41

A QUALITATIVE STUDY OF YOUTHS' AND PARENTS' REACTIONS TO E-CIGARETTE PREVENTION ADVERTISEMENTS

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Growing rates of e-cigarette use among youth have reached epidemic proportions. Media messages have been deployed to counteract this trend, but their evaluations are lacking. We assessed youth's and parents' reactions to various existing e-cigarette prevention messages. In 2019, 12 focus groups were conducted with youth (n=63) and



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parents (n=27) living in the Southeastern US (youth: 52% Black, 27% White; parents: 89% Black, 7% White). Participants discussed their reactions to 9 e-cigarette prevention messages with various topics. The messages were drawn from existing e-cigarette prevention campaigns and messages we developed previously for other studies. Information on chemicals in e-cigarettes was seen as new and scary, but unknown chemical names created confusion. Youth appreciated novel ways to visualize health effects of e-cigarettes (parasites in the body) and nicotine's effect on behavior (mood swings), but they cautioned that some of these effects (irritability) are not always caused by nicotine. Some participants did not know if e-cigarette companies were "big tobacco." Some found it hard to argue with the financial costs of vaping, but others did not think they were too great. Participants recommended messages featuring testimonials from diverse adolescents and messages aimed at youth who are struggling with addiction to e-cigarettes. Messages would be particularly effective if they featured real youth and did not look like adults created them for youth. Another area that is currently not covered in media messages is talking to youth who are using e-cigarettes and might be already addicted but do not know where to turn for help. These adolescents need to be referred to resources for cessation.

FUNDING: Other

PH-42

TOBACCO PRODUCT USE AMONG MIDDLE AND HIGH SCHOOL STUDENTS— UNITED STATES, 1999-2019

Linda Neff, PhD, MSPH. CDC.

The tobacco product landscape continues to evolve to include a variety of combustible, non-combustible, and electronic products. Most tobacco product use begins before 18 years of age. Although the prevalence of current cigarette smoking has declined among U.S. youth over the past two decades, use of other tobacco products has stayed the same or increased. Recent changes to the tobacco product landscape over the past two decades, such as the introduction of electronic cigarette (e-cigarette) devices, has shifted the types of products used among youth. Since 2014, e-cigarettes have been the most commonly used tobacco product among U.S. middle and high school students. The National Youth Tobacco Survey (NYTS), conducted periodically during 1999–2009 and annually since 2011, provides national data on estimates of tobacco product use. NYTS is a nationally representative survey of U.S. middle school (grades 6–8) and high school (grades 9–12) students that focuses exclusively on tobacco use behaviors and associated factors. This report uses findings from the 1999 to 2019 NYTS to describe the trajectory of tobacco product use among middle and high school students. For example, in 1999, the prevalence of current cigarette smoking was 35% among 12th grade high school students, which is the same as the prevalence for e-cigarette use in 12th grade students twenty years later in 2019 (34.5%). Linear decreases occurred for current cigarette smoking during the period of 1999 to 2019. In comparison, current e-cigarette use increased nonlinearly from 2014 to 2019. While current cigarette smoking among high school students has decreased significantly, overall tobacco use remains persistently high and e-cigarette use among youth has been declared an epidemic by the U.S. Surgeon General. The current use of other tobacco products also remained unchanged. Continued efforts are warranted to prevent and reduce all forms of tobacco product use among U.S. youths.

PH-44

TOBACCO USE AMONG SEXUAL AND GENDER MINORITY AND NON-MINORITY COLLEGE STUDENTS

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Introduction. Previous studies have revealed disparities in tobacco use associated with sexual and gender minority (SGM) status among several cohorts, e.g., adults and young adults. The goal of this project was to assess potential disparities in tobacco use (current use and ever-use) associated with the SGM status among college students. Considered tobacco products included regular cigarettes, e-cigarettes, cigars (including little cigars and clove cigarettes), hookah tobacco and smokeless tobacco. **Methods.** We used the 2019 Spring National College Health Assessment data collected by the American College Health Association at one large, southeastern university. Statistical methods included Chi-Square (CS) tests for associations and multiple logistic regression models. Significance level was fixed at 5% level. Computing was performed using SAS@9.4 software. **Preliminary Results.** The preliminary findings were based on a sample of 536 students (that might be further refined). Significant differences were detected for current use of regular cigarettes (CS=12.4, df=2, p=0.002) and current use of hookah tobacco (CS=8.9, df=2, p=0.012), as well as ever-use of any tobacco product

(CS=4.6, df=1, p=0.031), ever use of regular cigarettes (CS=12.2, df=1, p<0.001; 23% for SGM and 11% for non-SGM students), and ever-use of hookah tobacco (CS=5.0, df=1, p=0.025; 23% for SGM and 15% for non-SGM students). Prevalence of ever-use of e-cigarettes (20% for SGM and 16% for non-SGM students), cigars (12% for SGM and 12% for non-SGM students) and smokeless tobacco (3% for SGM and 3% for non-SGM students) was not significantly different for SGM students relative to non-SGM students. **Conclusions.** Our preliminary findings reinforced the importance of evaluating disparities in tobacco use among SGM and non-SGM students and indicated that the disparities vary among the tobacco products. The findings confirmed that SGM students have higher or comparable prevalence of tobacco use for each tobacco product. During our presentation we will discuss our current findings and share the results based on models that adjust for students' demographic characteristics.

PH-45

DEVELOPMENT OF A mHEALTH APP FOR AMBIVALENT SMOKERS: FORMATIVE UX DESIGN AND EVALUATION

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Background: Most smokers want to quit someday, but are not yet ready to stop smoking (i.e., they are ambivalent about quitting). mHealth apps could allow cost-efficient intervention with these smokers, but to date, no evidence-based apps are available. **Objective:** Using user-centered design methods, we developed and conducted formative evaluation of the core content for an mHealth app targeting ambivalent smokers. The content was theoretically-grounded and patterned after that previously tested in our phone-based interventions; it consisted of a series of "personal experiments" (i.e., brief cognitive or behavioral tasks) designed to boost readiness to quit smoking. **Methods:** We first conducted user interviews with ambivalent smokers (n=3) using a low-fidelity prototype of 5 potential experiments. We then conducted a pilot study (n=25) using a medium-fidelity prototype consisting of 7 experiments to assess user receptivity and potential impact of the content on users' motivation and self-efficacy to quit or reduce smoking. User reactions were assessed following each experiment and at the conclusion of the program. **Results:** Interviewees liked the "personal experiment" concept and pilot participants found the prototype to be engaging and acceptable. After watching a brief orientation video that explained the intent of the experiments, most participants (80%, 20/25) said the program sounded interesting, primarily because it did not require a commitment to quit smoking. 100% (25/25) completed all 7 experiments, including a 24-hour quit attempt. The mean rating of usefulness of the overall program was 4.12 (SD=1.09) out of 5, and the average difficulty rating of the experiments was 2.16 (SD=1.18) out of 5. At end-of-program, 92% (23/25) told us that they were more interested in either quitting or cutting back than when they began the program, and 72% (18/25) said that if it had been provided, they would have used nicotine replacement therapy (NRT) to try to quit smoking. Additional design insights that were learned will be presented, as well as an overview of the finalized intervention design which is now being tested in a randomized pilot trial.

FUNDING: Federal; Nonprofit grant funding entity

PH-46

IMPACT OF AGE AT SMOKING INITIATION ON PREVALENCE OF MULTIPLE HEALTH BEHAVIORS AMONG U.S. ADULTS

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Significance 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. 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. While 23.8% of early smoking initiators (< age 16) engaged in zero risk behavior at the time of interview vs. 29.7% of late initiators (\geq age 19), 1.2% engaged in all three risk behaviors vs. 0.7% of later smoking initiators. 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

PH-47

LONGITUDINAL EXAMINATION OF SUBJECTIVE EXPERIENCES AT E-CIGARETTE INITIATION AND PAST 30-DAY E-CIGARETTE USE AMONG ADOLESCENTS IN TEXAS

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Significance: Subjective experiences (SEs) at first use of a tobacco product can include "symptoms" such as feeling relaxed; getting a rush/buzz; dizziness; nausea; and coughing. Limited research has examined SEs at initiation of electronic cigarettes (e-cigarettes). This study aims to: (1) determine how SEs cluster at e-cigarette initiation; and (2) determine if SEs at e-cigarette initiation predict subsequent past 30-day tobacco use behavior, among a large cohort of adolescents. **Methods:** This study used longitudinal data from the Texas Adolescent Tobacco and Marketing Surveillance system (TATAMS), collected biannually, from Fall 2014 - Spring 2017 (2.5 years). Participants were a representative sample of adolescents who reported ever e-cigarette use across any wave ($n=3,523$; $N=567,879$). Self-reported SEs at e-cigarette initiation that were assessed included: (1) Rush or Buzz; (2) Relaxed or Good; (3) Dizziness; (4) Coughing; (5) Nausea. An exploratory factor analysis (EFA) was used to determine the factor structure of these SEs, or how they clustered at first use. Weighted logistic regression was used to examine the longitudinal association between SEs at initiation and subsequent past 30-day e-cigarette use. **Results:** EFA revealed two clusters of subjective experiences at e-cigarette initiation: positive (rush, relaxed) and negative (dizziness, coughing, nausea). Feeling relaxed or good (46.9%) was the most common SE at e-cigarette initiation; coughing (18.1%) was the most common negative SE at e-cigarette initiation. Positive SEs at e-cigarette initiation were associated with progression to past 30-day e-cigarette use (adj OR: 1.20; 95% CI: 1.02 - 1.42), controlling for negative subjective experiences and other covariates. Negative SEs were not related to subsequent past 30-day e-cigarette use. **Conclusion:** Among these adolescents, positive SEs were much more common than negative SEs at first use of an e-cigarette. Additionally, this is the first study, to our knowledge, that directly observes a statistically significant relationship between positive subjective experiences at e-cigarette initiation and subsequent past 30-day e-cigarette use among adolescents.

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PH-48

MULTIPLE TOBACCO PRODUCT USE AMONG CIGARETTE SMOKERS: A LONGITUDINAL EXAMINATION OF MENTHOL AND NON-MENTHOL SMOKERS DURING YOUNG ADULTHOOD

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Significance: Multiple tobacco product (MTP) use is common among young adults. Most MTP users are combustible cigarette smokers that use one or more other tobacco products. This study aims to explore menthol as a risk factor for MTP use among a cohort of young adult cigarette smokers. **Methods:** Participants were 18-29 year old past 30-day cigarette smokers at 24 Texas colleges and universities in a 6-wave study. Participants ($n=4,700$ observations) were classified as: (1) single product users (i.e., exclusive cigarette smoking); (2) dual tobacco product users; and (3) poly tobacco product users. A longitudinal, multi-level, ordered logistic regression model was used

to examine the association between menthol cigarette smoking and MTP use. Two longitudinal, multi-level, multinomial logistic regressions were used to examine the relationship between menthol cigarette smoking and number of tobacco products used. **Results:** Overall, 40.7% of participants were single product users, 33.7% were dual tobacco users, and 25.6% were poly tobacco users. Past 30-day use of menthol cigarettes was longitudinally associated with 1.28 (95% CI: 1.14 - 1.44) greater odds of multiple tobacco product use. Further, menthol was longitudinally associated with 1.19 (95% CI: 1.03 - 1.37) greater risk of dual and 1.40 (95% CI 1.19 - 1.65) greater risk of poly tobacco product use, relative to single tobacco product use. Lastly, menthol cigarette smoking was longitudinally associated with 1.18 (95% CI: 1.01 - 1.39) greater risk of poly tobacco product use, relative to dual tobacco product use. **Conclusions:** Most (59.3%) young adult cigarette smokers used more than one tobacco product. Additionally, there was a gradient relationship between menthol cigarette smoking and number of tobacco products used among young adult cigarette smokers. Findings provide for greater regulatory and programmatic efforts to reduce menthol cigarette smoking as a method of reducing multiple tobacco product use among young adults.

FUNDING: Federal

PH-49

A LONGITUDINAL EXAMINATION OF BEHAVIORAL TRANSITIONS AMONG YOUNG ADULT MENTHOL AND NON-MENTHOL CIGARETTE SMOKERS USING A THREE-STATE MARKOV MODEL

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Significance: Menthol cigarettes have traditionally been perceived as a "starter product" for young smokers who later transition to non-menthol cigarettes; however, emerging research on young adults indicates that trajectory may be shifting. This research aims to longitudinally explore multi-directional transitions in cigarette smoking behaviors including: (1) switching between menthol/non-menthol cigarettes; (2) discontinuation of cigarette smoking among menthol and non-menthol smokers; and (3) returning to menthol or non-menthol smoking, among a cohort of young adult. **Methods:** A Markov model was applied to biannual data for $n=1,542$ young adults (mean age: 20.9 years; $SD=2.6$) in Texas, who provided 7,021 total observations from Fall 2014 - Spring 2017 (2.5 years). All participants were menthol or non-menthol past 30-day cigarette smokers at first observation. We examined transitions across three states of cigarette smoking (menthol, non-menthol, and nonsmoking) during young adulthood as well as socio-demographic predictors of each transition. **Results:** Descriptively, 22.2% of menthol and 14.3% of non-menthol smokers switched between products while 25.6% of menthol and 26.0% of non-menthol smokers quit smoking altogether. Among quitters, 20.0% relapsed via menthol and 28.2% relapsed via non-menthol cigarettes. Hispanic/Latinos (Hazard Ratio [HR]: 3.69; 95% CI: 1.78 - 7.66) and Asian (HR: 2.85; 95% CI: 1.15 - 7.08) were significantly more likely to switch from non-menthol to menthol cigarettes, relative to non-Hispanic whites. Among quitters, use of non-cigarette products significantly increased the risk of smoking relapse via menthol (HR: 1.54; 95% CI: 1.04 - 2.30) and non-menthol (HR: 1.85; 95% CI: 1.34 - 2.54) cigarettes. **Conclusion:** A substantial proportion of young adult cigarette smokers transitioned across cigarette smoking states over the course of 2.5-years. Results indicate that Hispanic/Latino and Asian young adults are at increased risk to transition to menthol cigarette smoking. Findings highlight need for further study of Hispanic/Latino and Asian young adult smoking behaviors.

FUNDING: Federal

PH-50

THE ROLE OF E-CIGARETTES FOR QUITTING OR REDUCING SMOKING IN THE 30S: LONGITUDINAL CHANGES AND MODERATED RELATIONSHIPS

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Significance: Electronic cigarettes (e-cigs) have been marketed as a potential aid in quitting or reducing combustible cigarette (c-cig) use, though empirical studies are mixed. This study examined the extent to which e-cig initiation among smokers in their 30s predicted quitting or reducing smoking or nicotine dependence symptoms by age 39. Whether the role of e-cigs in quitting differed by prospectively-assessed moderators was also examined. **Methods:** Data were from the Seattle Social Development Project (SSDP), a panel study of 808 diverse participants with high retention. A subsample of 221 smokers at age 33 was selected for analysis. Self-reports of c-cig use and dependence were assessed longitudinally at ages 33 and 39. Sixteen potential moderators were



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examined, including social demographics, smoking attitudes and desire to quit, other health behaviors and status, and adolescent and early adult assessments of smoking history. **Results:** The use of e-cigs was consistently associated with a lower likelihood of quitting c-cigs by age 39, after accounting for frequency of prior c-cig use at age 33. This negative association persisted across all moderators examined, although it was nonsignificant among those with a definite desire to cut down. Among those who did not quit smoking, e-cig use had no association with decreases in either quantity of c-cigs used or dependence symptoms. **Conclusions:** Results indicate that e-cigarette use was not helpful for quitting or reducing combustible cigarette use in the 30s. Rather, across extensive tests of moderation, e-cig initiation consistently predicted less quitting during this important age period for successful cessation.

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PH-51

TOBACCO QUIT INTENTIONS AND BEHAVIORS AMONG CIGAR SMOKERS IN THE UNITED STATES IN RESPONSE TO COVID-19

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Significance. Combustible tobacco users appear to be at greater risk for serious complications from COVID-19. Because of the potential negative health outcomes of COVID-19, it is possible that many tobacco users feel vulnerable and are trying to quit using tobacco in response to COVID-19. However, it is also possible that some tobacco users are increasing their tobacco use due to stress or anxiety associated with COVID-19. More research is needed to determine how tobacco users are perceiving and reacting to COVID-19. **Methods.** This study examined cigar smokers' perceived risk of COVID-19, quit intentions, and behaviors during the current pandemic. We conducted an online study between April 23, 2020 to May 7, 2020 as part of an ongoing study examining perceptions of different health effects of cigars. All participants used cigars in the past 30 days (n=777) and lived in the United States. **Results.** Three-quarters of the sample (76.0%) perceived they had a higher risk of complications from COVID-19 compared to non-smokers. The majority of participants (70.8%) intended to quit in the next six months due to COVID-19, and almost half of the sample (46.4%) reported making a quit attempt since the start of the COVID-19 pandemic. Far more participants reported increasing their tobacco use since COVID-19 started (40.9%) vs. decreasing their tobacco use (17.8%). Black or African American participants, participants who used a quitline, and participants with higher COVID-19 risk perceptions had higher intentions to quit using tobacco due to COVID-19 and higher odds of making a quit attempt since COVID-19 started. **Conclusions.** While cigar smokers in this study appear to know their higher risk of potential COVID-19 complications and express high quit intentions and quit attempts since COVID-19 started, more cigar smokers reported increasing their tobacco use due to COVID-19 than decreasing their tobacco use. More research is needed to understand how tobacco users are perceiving COVID-19 risks and changing their tobacco use behaviors. As data become available, clear and concise public health messaging is needed to communicate risks of COVID-19 to tobacco users.

FUNDING: Federal

PH-52

ADOLESCENTS AND YOUNG ADULTS WHO VAPE OR ARE SUSCEPTIBLE TO VAPING -- CHARACTERISTICS, PRODUCT PREFERENCES AND BELIEFS

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Significance: Despite increasing evidence of the harms of e-cigarettes, vaping among young people in the U.S. remains at epidemic levels. This study examined differences among current vapers, those susceptible to vaping, and those non-susceptible among adolescents and young adults in the U.S. We sought to understand vaping-related characteristics, product preferences, and risk beliefs across these populations to inform prevention efforts. **Methods:** Participants were convenience samples of N=543 adolescents and N=557 young adults, both recruited in mid-2019. We assessed vaping preferences, tobacco product use, and both health harm and addiction risk beliefs about vaping. We ran separate multivariate logistic regressions (adjusting for several covariates) to assess determinants of adolescent and young adult vaping and susceptibility to vaping. The main predictors in these models were addiction and health harm risk beliefs about vaping. **Results:** A majority of adolescents and young adults were either current vapers (32% and 36%, respectively) or susceptible to vaping (34% and 24%).

Most adolescent vapers also used other tobacco products (e.g., cigarettes) in the past 30 days (79%), whereas young adult vapers predominately used e-cigarettes only (64%). In both samples, pod-based devices were the most common device type used, and fruit and mint/menthol were the most commonly used flavors. In multivariate analyses, adolescent ($p < .05$) and young adult ($p < .05$) current vapers both had lower risk beliefs about the health harms of vaping compared to those susceptible to vaping. Susceptible adolescents also had lower health harm risk beliefs compared to those who were non-susceptible ($p < .05$). Addiction risk beliefs seldom predicted use or susceptibility in multivariate analyses, with only susceptible young adults having lower addiction beliefs than those non-susceptible ($p < .05$). **Conclusion:** Results from this study highlight the role of health harm risk beliefs among both adolescent and young adult vapers and those susceptible to vaping. Prevention efforts should examine the most potent ways to communicate vaping health harms to discourage adolescent and young adult vaping.

FUNDING: Federal; Academic Institution

PH-53

USE OF ALTERNATIVE TOBACCO PRODUCTS ON LONGITUDINAL TRANSITIONS IN CIGARETTE SMOKING AMONG COLLEGE STUDENTS: A MARKOV MODEL

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Significance: Although cigarette smoking has declined, very light smoking (5 or fewer cigarettes per day) is still common among young adults. Contemporaneous with the high prevalence of very light smoking has been the frequent use of alternative tobacco products (ATPs) and the increasing concurrent use of cigarettes and ATP among US young adults. Limited literature indicates that ATP use may play a role in the prevalence and progression of cigarette smoking among young adults. The purpose of this study is to examine transitions in cigarette smoking (never vs. non-current vs. very light vs. heavier) among college students across 2.5 years using Markov models, and determine if use of ATPs (electronic cigarettes, cigars, and hookah) impacts these transitions. **Method:** This study used six waves of online data across 2.5 years from Project M-PACT. A cohort of students was recruited from 24 colleges and surveyed at 6-month intervals from Oct 2014 to May 2017. Participants who were 18-25 years old (M age = 20.2; SD = 1.84; 63.7% female; 35.2% non-Hispanic white) at baseline were included in this study (n = 4806). Cigarette smoking status was categorized as never smoking, non-current smoking [0 cigarettes smoked per day (cpd) in past month], very light smoking (1-5 cpd in past month), and heavier smoking (≥ 6 cpd in past month). Continuous-time Markov models were used to examine temporal transitions in the four smoking statuses and examine the association of baseline ATP use with transitions in smoking status. **Results:** Baseline ATP use was significantly related to increased odds of transitioning from never smoking to very light smoking (Hazard ratio = 2.94, $p < .05$), from non-current to very light smoking (Hazard ratio = 1.86, $p < .05$), and decreased odds of transitioning from very light smoking to non-current smoking (Hazard ratio = 0.87, $p < .05$). The probabilities of remaining in a smoking status decreased over time. The average time for college students to maintain very light smoking status was about one year. **Conclusions:** Findings highlight the role of ATP use in promoting cigarette smoking among college students and the need for preventive interventions with this population.

FUNDING: Federal

PH-54

FEASIBILITY AND ACCEPTABILITY OF DECIDETEXTO, A MOBILE SMOKING CESSATION INTERVENTION, IN PUERTO RICO

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Background: Puerto Ricans constitute a Latino group that, despite their US citizenship status, experience sociodemographic disadvantages, including limited access to smoking cessation resources. **Objective:** Assess the feasibility and acceptability of *Decidetexto*, a mobile smoking cessation intervention, in Puerto Rico. **Methods:** Puerto Rican smokers living in Puerto Rico (n=26) were enrolled in *Decidetexto*. *Decidetexto*, available in English and Spanish, incorporates three integrated components: 1) a tablet-based software that collects smoking-related information to develop an individualized quit plan, 2) a 24-week text messaging counseling program with interactive capabilities, and 3) pharmacotherapy (NRT) support. Outcome measures included self-reported 7-day point prevalence abstinence, pharmacotherapy adherence, satisfaction with the



intervention, changes in self-efficacy, and text messaging interactivity. **Results:** Average age of the participants was 46.8 years (SD 12.7), half of them (53.8%) were female. Almost all participants (96.2%) selected Spanish as their language of preference. Most participants (92.3%) smoked daily and half of them (53.8%) used menthol cigarettes. Participants sent an average of 42.9 text messages (SD 31.9) to the program. All participants requested nicotine patches at baseline. However, only 13.0% of participants used the patch >75% of days. At Week 12, 10 participants (38.4%) self-reported 7-day point prevalence abstinence (88.5% follow-up rate). Most participants (95.6%) reported being satisfied/extremely satisfied with the intervention. Self-efficacy mean scores significantly increased from 40.4 (SD 12.1) at baseline to 57.9 (SD 11.3) at follow-up ($p < 0.01$). **Conclusions:** The *Decidetexto* smoking cessation intervention generated high satisfaction and frequent interactivity, significantly increased self-efficacy, and resulted in noteworthy cessation rates at Week 12, despite low adherence to NRT. Future studies should improve medication adherence among participants. Contextual stressors relevant to Puerto Rico (e.g., earthquakes aid crisis, COVID-19) should be assessed in the context of smoking cessation. Additional testing as a randomized clinical trial is warranted.

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PH-55

IMPACTS OF COVID-19 ON ELECTRONIC CIGARETTE USE, PURCHASING, AND RELATED BEHAVIORS

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INTRODUCTION: COVID-19 has caused health impacts and disruptions around the world. Electronic cigarette (ECIG) users may face additional COVID-19 impacts. This study examined impacts of COVID-19 on ECIG users in the United States. **METHODS:** Concept mapping, a mixed methods approach, was used to identify COVID-19 impacts on adult ECIG users. Past 30-day ECIG users were recruited from 24 randomly selected Craigslist locations. At a study website, participants ($n=93$; mean age=35.1, SD=10.8) provided statements completing a prompt: "A specific way Coronavirus/COVID-19 has affected my vaping/e-cigarette use, my vaping/e-cigarette related purchasing, or other vaping/e-cigarette related behaviors or issues is...". Participants sorted a final list of 85 generated statements into piles of similar content and rated statements based on how true statements were for them. Multidimensional scaling and hierarchical cluster analysis of sorting data identified thematic clusters. Mean cluster ratings were compared between sample subgroups. **RESULTS:** Ten clusters were identified: 1) Stocking up and Bulk Purchasing, 2) Challenges in Obtaining ECIG Supplies, 3) Alternative Purchasing Procedures, 4) Increased ECIG use, 5) Disruption of Routine and ECIG Use, 6) Efforts to Decrease ECIG Use, 7) Improving ECIG Skills, 8) COVID-19 Health Concerns, 9) Perceptions of ECIG Use and COVID-19, and 10) COVID-19 Protection. More dependent ECIG users rated the Increased ECIG Use, COVID-19 Health Concerns, and Disruption in Routine and ECIG Use clusters significantly higher (more true) than less dependent ECIG users. Dual users of ECIGs and cigarettes rated the Stocking Up and Bulk Purchasing, Efforts to Decrease ECIG Use, Improving ECIG Skills, Increased ECIG Use, and Disruption in Routine and ECIG Use clusters significantly higher than non-dual users. Some statements suggested perceptions that ECIG use may protect against COVID-19. **CONCLUSIONS:** ECIG users experience additional COVID-19 impacts, such as potential for increased exposure, financial burdens, stress, and health risks. Statements suggesting increased ECIG use and that ECIG use may protect against COVID-19 are a public health concern.

FUNDING: Federal

PH-56

SELF-REPORTED EXPOSURE TO WARNINGS ON TOBACCO PRODUCTS AMONG YOUTH

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Significance. Few studies have examined youth exposure to non-cigarette tobacco product warnings. **Methods.** We analyzed high schooler data from the 2019 National Youth Tobacco Survey ($n=10,181$). Participants reported frequency of exposure to warnings on cigar, e-cigarette, and waterpipe tobacco packages in the past 30 days

("always" or "most of the time" vs. less often) and how harmful they perceived using e-cigarettes and waterpipe some days but not every day ("a lot" vs less harmful). We used SAS logistic regression survey procedures to account for the complex survey design and sample weights. **Results.** Reported exposure to warnings was highest for cigars (22.6%), followed by e-cigarettes (20.8%) and waterpipe tobacco (6.9%). Youth who were susceptible to using cigars (aOR: 1.53; 95% CI: 1.29, 1.82), ever used cigars (aOR: 4.32, 95% CI: 3.57, 5.22) or currently used cigars (aOR: 8.90; 95% CI: 6.95, 11.39) had higher odds of reporting high exposure to cigar warnings. Similar findings were observed for exposure to e-cigarette warnings and waterpipe tobacco warnings. Significant interactions indicated that among youth who had ever used e-cigarettes, exposure to warnings was associated with higher odds of perceiving e-cigarettes as harmful (aOR: 1.50; 95% CI: 1.05, 2.15); conversely, among youth who currently used e-cigarettes, exposure to warnings was associated with lower odds of perceiving e-cigarettes as harmful (aOR: 0.75; 95% CI: 0.56, 0.99). Youth who had high exposure to waterpipe tobacco warnings had higher odds of perceiving waterpipe tobacco as harmful (aOR: 1.21, 95% CI: 1.00, 1.45). **Conclusions.** About one-fifth of high school students reported frequent exposure to warnings on cigar and e-cigarette packages, although fewer reported this for waterpipe tobacco packages. For ever e-cigarette users and all waterpipe tobacco users, exposure to warnings was associated with high perceived harmfulness of these products. Youth see warnings on non-cigarette tobacco products, and further research is needed on how to strengthen these warnings.

FUNDING: Unfunded

PH-57

USING TOPIC MODELLING TO UNDERSTAND THE INTERSECTION OF THE ONLINE VAPING NARRATIVE WITH COVID-19

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Significance: The relationship between vaping and contracting COVID-19 is unclear, with conflicting information online. There is some scientific evidence that vaping, cannabidiol (CBD - an active ingredient in cannabis from the hemp plant) or other substances, may be associated with more severe manifestations of COVID-19. However, there is also inaccurate information that vaping can aid COVID-19 treatment, and that CBD, possibly administered through vaping, can mitigate COVID-19 symptoms. Thus, we need to study the spread of inaccurate information to better understand how to promote scientific knowledge and curb inaccurate information, critical to vapers' health. Inaccurate information about vaping and COVID-19 may affect COVID-19 treatment outcomes. **Objective:** Using structural topic modelling, we mapped temporal trends in the online vaping narrative (a large dataset comprising online vaping chatter from several sources) to indicate how the narrative changed during COVID-19. **Methods:** We obtained data using a textual query that scanned a data pool of approximately 200000 (4027172 documents and 361100284 words) different domains such as public online forums, blogs and social media from August 1 2019 - April 21 2020. We then used structural topic modelling to understand changes in word prevalence and semantic structures within topics around vaping before and after December 31 2019, when COVID-19 was reported to the World Health Organization (WHO). **Results:** The online vaping narrative could be organized into the following groups or archetypes: 1) Harms from vaping; 2) Vaping regulation; 3) Vaping as harm reduction/treatment; 4) Vaping lifestyle. There were three archetypes pre-COVID-19, but four archetypes post-COVID-19 (vaping as harm reduction/treatment was the additional archetype). There was an emergence of a CBD product preference topic post-COVID-19 report, possibly related to vapers using CBD as COVID-19 treatment. **Conclusions:** Our main finding is the emergence of a vape-administered CBD treatment narrative around COVID-19, when comparing the pre-COVID-19 versus during COVID-19 online vaping narrative. Results are key to understanding how vapers respond to inaccurate information about COVID-19, allowing for optimized treatment of vapers who contract COVID-19, and possibly minimizing instances of inaccurate information. Findings have implications for the management of COVID-19 among vapers and monitoring of online content pertinent to tobacco, to develop targeted interventions to manage COVID-19 among vapers.

FUNDING: Nonprofit grant funding entity



PH-58

RACIAL DIFFERENCES REGARDING ATTITUDES TOWARDS MENTHOL CIGARETTE USE AND OTHER SOCIOCULTURAL FACTORS RELATED TO SMOKING

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Significance: Menthol cigarette initiation and preference has been shown to be influenced by multiple sociocultural factors and attitudes. Specific differences in attitudes or sociocultural factors between racial groups may continue to drive the greater preference for menthol cigarette use among racial minority smokers. The current study explored racial differences among menthol smokers in attitudes towards menthol cigarette use and sociocultural factors related to cigarette smoking. **Methods:** Thirty White and African American (AA), menthol cigarette smokers (47% female, 53% AA, age M=42.9 yrs, 14.0 (SD=6.4) cigs/day) participated in a laboratory study of cognition and menthol cigarette use. Participants completed the Menthol Attitudes Scale (MAS) assessing for attitudes/perceptions towards menthol cigarettes (e.g., health perceptions, being less harmful, preference for taste/sensation). Participants also responded to additional questions on sociocultural factors related to menthol cigarette use (e.g., exposure to marketing, social surroundings). One-way analyses of variance were used to examine differences in attitudes and sociocultural factors relating to menthol use between racial groups (White vs. AA). **Results:** No significant differences were found between groups on any MAS subscales. Racial differences were only found on sociocultural factors regarding marketing exposure to menthol cigarettes ($F(1,28)=8.82, p=0.01$) and social ties to menthol cigarette use ($F(1,27)=10.74, p=.003$); where AA smokers were more likely to report seeing menthol cigarette ads or taking advantage of promotional offers, and that their parents ($F(1,22)=10.37, p=.004$) and siblings ($F(1,17)=7.47, p=.01$) also preferred to smoke menthol cigarettes if they smoked. **Conclusion:** Marketing and social relationships may particularly impact menthol cigarette use among AA smokers. With high prevalence rates of menthol cigarette use among racial and ethnic minority smokers, it remains important to consider how other environmental or external factors may be targeted in addressing smoking cessation treatment and health-related disparities in minority communities.

FUNDING: Academic Institution; Nonprofit grant funding entity

PH-59

ASSOCIATION BETWEEN OBSERVING PEERS VAPING ON CAMPUS AND E-CIGARETTE USE AND SUSCEPTIBILITY IN MIDDLE AND HIGH SCHOOL STUDENTS

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Significance: The aim of this study is to examine the association between exposure to e-cigarette use on school campus and e-cigarette use behaviors among adolescents in the United States. **Methods:** Data were obtained from a nationally representative sample of U.S. students ($n=19,018$) in grades 6 to 12 participating in the 2019 National Youth Tobacco Survey. First, two multivariate logistic regression models examined the association between in-school exposure to e-cigarette use and ever and past 30-day (i.e., current) e-cigarette use among the total sample. Next, a multivariate logistic regression model to examine the relationship between in-school exposure to e-cigarette use and susceptibility to use was conducted among a subsample ($n=11,958$) of never e-cigarette users. Covariates included grade, race/ethnicity, marketing exposure, and ever use of other tobacco products. **Results:** Approximately 64.3% of adolescents reported seeing someone use an e-cigarette on school campus; the most common locations being in the bathroom/locker room (34.4%) and parking lot (34.0%). In-school exposure to e-cigarette use was associated with greater odds of ever (Adj OR: 2.06; 1.82 - 2.33) and current (Adj OR: 1.70; 1.46 - 1.98) e-cigarette use among the full sample, as well as greater odds of susceptibility to use (Adj OR: 2.00; 1.82 - 2.20) among never users. **Conclusions:** Exposure to e-cigarette use on school campus was associated with greater odds of e-cigarette use and susceptibility among adolescents in the US. It is plausible exposure to e-cigarette use on campus reinforces the social acceptability of adolescent e-cigarette use. Findings suggest a need for more effective enforcement of school tobacco policies to reduce social exposure to teen e-cigarette use. Findings further indicate the need to consider use of school monitoring in locations of campus such as bathroom/locker rooms and parking lots.

FUNDING: Federal

PH-60

ASSOCIATION OF HARM PERCEPTIONS AND TOBACCO USE DECLINES WITH GRADE: FINDINGS FROM A NATIONALLY REPRESENTATIVE SAMPLE OF MIDDLE AND HIGH SCHOOL STUDENTS, 2016-2018

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Significance: Harm perceptions are a determinant of tobacco use during adolescence. However, research suggests harm perceptions may not be as influential as a determinant of tobacco use among older youth. The aim of this study is to examine and quantify the role of grade-level on the relationship between harm perceptions and tobacco use among adolescents. **Methods:** We analyzed three years of cross-sectional data from the National Youth Tobacco Survey (2016-2018). Participants were $n=53,277$ middle and high school students in the United States. First, we used a multi-level, multivariate logistic regression to examine the association between perceived harm of all tobacco products and past 30-day use of any tobacco product. Next, we examined grade-level differences (i.e., interaction effect) in the association between harm perceptions and past 30-day tobacco use. Covariates included sex, race/ethnicity, number of tobacco products ever used, and living with a tobacco user. Survey year was included to account for nesting. **Results:** Perceiving all tobacco products as harmful was associated with 3.71 (95% CI: 3.42 - 4.02) greater odds of not using a tobacco product in the past 30-days. The interaction effect model was statistically significant ($p < 0.001$), with the effect size (i.e., odds ratio) of the relationship between harm perceptions and tobacco use behaviors declining by approximately 12% (Adj OR: 0.88; 95% CI: 0.84 - 0.92) with each unit increase in grade. **Conclusions:** The positive relationship between harm perceptions and abstaining from tobacco use found in this representative sample of U.S. adolescents reinforces the importance of this determinant for adolescent tobacco use. Our findings of a decline in the association between harm perceptions and tobacco use as adolescents get older underscore the need to account for grade-level differences in the relationship between harm perceptions and tobacco use when developing age-appropriate interventions.

FUNDING: Federal

PH-61

EARLY CHANGES IN SMOKING INTENSITY AMONG SMOKERS EXCLUSIVELY USING OPEN-LABEL VERY LOW NICOTINE CONTENT CIGARETTES

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SIGNIFICANCE: The Food and Drug Administration is considering limiting nicotine in cigarettes to decrease smoking prevalence. Some people may compensate for lower nicotine content by smoking more cigarettes or by smoking individual cigarettes more intensely. Research on nicotine reduction shows minimal evidence of compensation, but findings from clinical trials are limited by non-adherence. A recent residential study saw no increases in cigarette consumption when open-label, very low nicotine cigarettes were used exclusively for several days. The objective of this study is to investigate smoking intensity among these participants in the same time frame. **METHODS:** Daily smokers ($n=16$) completed two, four-day hotel stays. During each respective stay they only had access to study cigarettes with either normal or very low nicotine content. Participants were notified of cigarette nicotine content at the beginning of each stay and purchased study cigarettes with money from a study bank. Cigarette filter butts were collected every 24-hours. Solanesol levels, indicative of smoke exposure from individual cigarettes, were measured in all butts and converted to estimates of mouth-level nicotine intake. Compensation indices for each 24-hour period of the very low nicotine stay were calculated to determine the average proportion of nicotine per cigarette recovered from changes in smoking intensity. **RESULTS:** Compensation indices were significantly greater than one throughout the very low nicotine stay, indicating some mouth-level nicotine was attributable to greater smoking intensity. However, compensation diminished across time ($p < 0.05$). On Day 1 the percentage of nicotine recovered from smoking intensity was 1.1% (95% CI = 0.8, 1.4) achieved by a change in intensity of 38.8% (95% CI = 28.3, 50.2); compared to 0.4% (95% CI = 0.2, 0.7) achieved by a change in intensity of 14.2% (95% CI = 5.5, 23.6) on Day 4. **CONCLUSION:** Some people may initially



increase smoking intensity when switching to exclusive very low nicotine cigarette use, yet this effect diminishes over time. Future studies may investigate a longer time course to test whether compensatory smoking continues to decline.

FUNDING: Federal

PH-62

RESPONSIVENESS OF ADULT SMOKERS WITH DEPRESSION TO PROSPECTIVE REGULATORY STRATEGIES TO REDUCE COMBUSTIBLE CIGARETTE USE

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Significance: Overall use of potentially less harmful products such as e-cigarettes among adults remains significantly lower than combustible cigarette use (3.2% vs 13.7% in 2018), and combustible cigarette use and its associated health risks are remain stubbornly higher over time among some populations, such as adults with symptoms of "any mental illness" (AMI) (28.1% in 2018). We still lack evidence regarding price elasticity of demand for cigarettes, and likelihood of substitution to potentially less harmful products among U.S. adults suffering from AMI, among whom depression is the most common disorder. **Methods:** 407 U.S. adult smokers were recruited via Amazon's Mechanical Turk to perform theoretical online cigarette purchase tasks to estimate difference in own-brand (OB) price elasticity of demand, and demand for alternative tobacco products among adults with depression and those without; depression was assessed using the Patient Health Questionnaire 9-Item (PHQ-9) scale. Alternative tobacco products included a low nicotine cigarette, and e-cigarettes with 1) comparable nicotine to the OB product, 2) a reduced harm message, or 3) a reduced carcinogen exposure message. Linear regression models were fit to the data, modeling associations between depression, price, and 1) variation in demand for own-brand cigarettes at different prices, 2) demand for four alternative products when the price of the own-brand product varied. **Results:** A 10% increase in OB price was significantly associated with an 8% reduction in OB demand across all participants ($\beta = -0.788$, SE: 0.041, $p < 0.05$), and the association an interaction between depression and price was positive and significant ($\beta = 0.133$, SE: 0.600, $p < 0.05$). OB price was a significant and positive predictor of increased demand for all products but the reduced harm e-cigarette, and depression was only significant in predicting increased demand for an e-cigarette with equivalent nicotine to the OB cigarette. **Conclusions:** Adults with symptoms of AMI, such as depressive symptoms, may be more reluctant to reduce smoking in the face of higher prices; however, they may be just as likely to choose substitutes under certain price and product policy conditions. Further research focusing on perceptions of and demand for various potentially less harmful products among this population could further illuminate a path to more effective policies related to alternative tobacco products.

FUNDING: Federal; Academic Institution

PH-63

THE EFFECT OF ADVERTISING FEATURES ON RECEPTIVITY OF ADOLESCENTS AND YOUNG ADULTS: A SUBGROUP ANALYSIS BY SMOKING STATUS

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Background: Receptivity to tobacco advertising is associated with higher likelihood of tobacco use, but little is known about what specific advertising features impact receptivity. Prior work suggests that sweepstakes, flora imagery and eco-friendly language may be associated with receptivity to cigarette ads. Understanding the effects of these advertising tactics on adolescents and young adults (YA) can inform potential regulatory strategies. **Methods:** 500 15-17 year-old (adolescent) never smokers, 500 adolescent ever smokers, 500 18-24 year-old YA current, past 30 day smokers, and 500 YA non-current smokers were randomized to view cigarette ads that were manipulated to either use, or not use, sweepstakes, flora imagery, and eco-friendly language. Each ad feature was manipulated across 5 cigarette brands. Participants who indicated they liked, were curious about or interested in using the product were considered to be receptive in multivariable logistic regressions. **Results:** Adolescent never smokers had higher odds of receptivity to ads with flora imagery or sweepstakes. Receptivity among adolescent ever smokers was dependent on the interaction between the brand of the ad and the ad feature, with sweepstakes and eco-friendly appeals resulting in higher

receptivity when used in a Camel ad. YA receptivity was not significantly associated with ad features alone, although ad feature did interact with brand to create higher receptivity among YA non-current smokers who viewed the Newport ad with sweepstakes present. **Conclusions:** Eco-friendly language, sweepstakes, and flora imagery appear to increase receptivity among adolescent never smokers and interact with specific ad brand for other subgroups. This finding indicates that the impact of ad features is highly contextual. A contextual effect is important in considering regulatory implications, as banning specific ad features may have a limited effect on a brand's overall appeal.

FUNDING: Federal

PH-64

SOCIAL INFLUENCES AND CIGAR SMOKING BEHAVIOR AMONG AFRICAN AMERICAN YOUTH

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Introduction: In 2019, 12.2% of African American/Black (AA) high school students in the United States reported past 30-day cigar smoking (CS) relative to 7.6% of White students. High use rates among AA youth/young adults necessitate early prevention/intervention efforts to mitigate disproportionately high tobacco-related morbidity/mortality rates affecting the AA community. This study aimed to assess the link between CS behavior and family/peer tobacco use, perceived social acceptability of CS, and CS-related harm perceptions among AA youth. **Methods:** In 2018-19, 13-17 year-old non-tobacco users (i.e., no past 6-month tobacco use; "nonsmokers") and past 30-day users of large cigars/filtered cigars/cigarillos ("cigar users") from largely AA neighborhoods in/around Richmond, VA, completed a cross-sectional in-person survey measuring demographics, CS behavior, family/peer tobacco use, and social acceptability/harm perceptions of CS. We used chi-square tests/independent samples t-tests to probe significant associations that were then entered into a logistic regression to assess correlates of CS. **Results:** The sample (n=201 total; n=46 cigar users) was 98.5% AA, 53.8% female, and on average 15 years old. Filtered cigar/cigarillo use was more prevalent (n=46; ~23%) than large cigar use (n=10; ~5.0%). Relative to nonsmokers, cigar users were more likely to be older and more likely to report tobacco use among family/peers, positive CS-related perceptions among people "important to you", and lower harm perceptions of CS ($p < 0.05$). Regression results were consistent with bivariate results: older age, family/peer tobacco use, neutral/positive perceptions of CS among those important to participants and lower CS-related harm perceptions were positively associated with odds of past-month CS behavior ($p < 0.05$). **Discussion:** Findings highlight the role of AA youths' social environment in tobacco use. We identified CS-specific risk factors in AA youth, including social tobacco-related norms among family/peers and harm perceptions. Tobacco prevention/intervention efforts for AA youth should entail methods that address tobacco use and beliefs among family and other social groups.

FUNDING: Federal; State

PH-66

SINGLE, DUAL, AND POLY USE PATTERNS OF TOBACCO PRODUCTS AMONG US OVERWEIGHT AND OBESE ADOLESCENTS

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Significance: Tobacco product use, especially electronic nicotine delivery systems (ENDS), is a public health concern among adolescents. Active smoking has been associated with increased adiposity measured via body mass index (BMI). Single, dual, and poly use of varying tobacco products may pose an additional risk to overweight and obese adolescents due to potentially already facing medical and social problems associated with their BMI status. This study examines the prevalence of single, dual, and poly use patterns of tobacco products based on BMI status among a U.S. representative sample of adolescents. **Methods:** Analysis of the 2017 Youth Risk Behavior Survey was conducted (N=12,681). Using BMI percentiles, participants were categorized into 3 groups: underweight/normal weight, overweight, and obese. Tobacco products were classified into 4 groups: 1) ENDS (e-cigarettes, vaping pens, e-hookah, and hookah pens); 2) conventional cigarettes; 3) other combustible tobacco products (cigars, cigarillos, filtered cigars, pipe); and 4) smokeless tobacco (chewing tobacco, snuff, dip, snus, or dissolvable tobacco products). These 4 groups were used to create 6 categories of use patterns. Logistic regression models were conducted and adjusted for sex, race/ethnicity, and grade level. **Results:** Of adolescents, 15.1% were overweight and 12.8% were obese. Among overweight youth, 16.0%, 5.9%, 7.3%, and 2.3% used 1, 2, 3, and



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4 of the tobacco product groups, respectively. Among obese youth, 17.8%, 7.5%, 7.4%, and 2.8% used 1, 2, 3, and 4, of the tobacco product groups, respectively. Dual use of ENDS and conventional cigarettes was the most prevalent. Compared to underweight/normal weight youth, overweight youth were more likely to use: conventional cigarettes and other combustible tobacco products (OR=1.61, 95%CI=1.2-2.16); ENDS and conventional cigarettes (OR=1.37, 95%CI=1.08-1.74); ENDS and smokeless tobacco (OR=1.57, 95%CI=1.18-2.09); ENDS and other combustible tobacco products (OR=1.41, 95%CI=1.12-1.76); other combustible tobacco products and smokeless tobacco products (OR=1.45, 95%CI=1.05-1.01); and conventional cigarettes and smokeless tobacco (OR=1.9, 95%CI=1.22-2.98). Compared to underweight/normal weight youth, obese youth were more likely to use ENDS and smokeless tobacco (OR=1.51, 95%CI=1.09-2.11). **Conclusion:** Understanding tobacco product use patterns among obese and overweight adolescents is beneficial for designing interventions and policies useful for preventing tobacco use among this high-risk group.

FUNDING: Unfunded; Academic Institution

PH-67

USING MAXIMUM DIFFERENCE CHOICE MODELS TO DIFFERENTIATE REASONS FOR E-CIGARETTE USE

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BACKGROUND: Understanding the reasons why young adults use e-cigarettes (i.e., vape) - and how such reasons may vary between individuals - is essential for informing tobacco regulatory efforts. To directly compare the relative importance of different reasons for use, we adopted a novel discrete choice task from the marketing field to rank and scale reasons for vaping. **METHODS:** An online panel of young adult vapers (n=255; age=18-30) completed a best-worst scaling task for 15 reasons for use. For 9 choice sets, 5 (of 15) reasons for vaping were presented and participants selected the most and least important reasons. A maximum difference analysis estimated the relative importance and rank of these reasons. Latent class analysis (LCA) identified groups of vapers with similarly ranked reasons for use; a multinomial regression evaluated the association of sociodemographic and tobacco use characteristics with class membership. **RESULTS:** Among all vapers, relaxation had the highest probability of being the most important reason for use (14.3%), followed by harm reduction (12.9%), affordability (10.3%), flavors (10.0%) and cigarette cessation (9.2%). LCA identified four distinct classes of vapers based on reasons for use: (1) a cessation class (i.e., primary reasons for use included cigarette cessation [19.6%] and harm reduction [17.1%]; n=91); (2) a recreation class (i.e., relaxation [18.7%], affordability [13.4%], flavors [12.7%], and socializing [8.7%]; n=90); (3) an experimentation class (i.e., boredom [10.0%], flavors [9.5%], experimentation [8.8%], and acceptability [8.3%]; n=48), and (4) a dependence class (i.e., unable to quit [16.4%], and harm reduction [13.6%]; n=26). Age, frequency of vaping, e-cigarette dependence, and patterns of tobacco use were each independently associated with predicted probability of class membership in multinomial models. **CONCLUSIONS:** Reasons for vaping differed in the relative rank and importance for different classes of vapers. These data highlight the need for tobacco control strategies that target different types of vapers in order to minimize the adverse public health impact of vaping among young people.

FUNDING: Federal

PH-68

MEASURING REACTIVITY TO GRAPHIC WARNING LABELS ON CIGARETTE PACKAGING

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SIGNIFICANCE: Graphic Warning Labels (GWLs) grab attention and trigger cognitions about health consequences of smoking as well as desire to quit. A measure of reactivity to GWLs can assist decision making on the selection of images, either on first implementation or when new GWLs are needed to overcome wear out. **METHOD:** During the baseline visit of an ongoing randomized controlled trial, we asked 276 smokers to complete an in-person pack handling task with randomized presentation of cigarette package designs (their own standard US pack, blank pack, three Australian plain packaging designs, obtained under license, and chosen to evoke different emotive reactivity). We recorded and transcribed each participant's 'stream of consciousness' as they considered each pack. A pair of different data reduction approaches were used:

1) six trained coders reviewed each participant's transcript and scored their reactions to each pack on a 7 point appeal-aversion (APAV) scale; and 2) we used a computerized natural language processing for each transcript to quantify the polarity of word choice and frequency of emotive words. **RESULTS:** The APAV score and valence of phrases were correlated (r 's range = .21-.37, p 's <.001). Smokers own pack has a positive appeal (APAV = 1.33 [95% CI = 1.23, 1.43]) and sentiment (polarity = 0.15 [95% CI = 0.13, 0.17]). The blank pack had neutral responses (APAV = 0.00 [95% CI = -0.02, 0.02]; polarity = 0.01 [95% CI = -0.01, 0.03]). The gangrenous foot GWL had the highest aversive response and negative sentiment (APAV = -2.45 [95% CI = -2.51, -2.39], polarity = -0.21 [95% CI = -0.23, -0.19]); followed by the premature baby (APAV = -1.85 [95% CI = -1.93, -1.77], polarity = -0.11 [95% CI = -0.13, -0.09]) and the throat stoma (APAV = -1.74 [95% CI = -1.82, -1.66], polarity = -0.08 [95% CI = -0.10, -0.06]). Semantic analysis further demonstrated that GWLs varied in their elicitation of anger, disgust, fear, and sadness compared to other designs, which will be presented. **CONCLUSION:** Smoker's reactivity to novel GWLs can be measured both for their overall appeal-aversion as well as the types of emotions that they engender. This reactivity may mediate the smoker's behavioral response when GWLs are mandated on all cigarette packs.

FUNDING: Federal; State

PH-69

RESULTS OF A RANDOMIZED TRIAL TESTING A MOBILE MESSAGING INTERVENTION FOR HOOKAH TOBACCO CESSATION IN YOUNG ADULTS

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Significance: Waterpipe (i.e., hookah) tobacco smoking is common among young adults, but there are very few cessation interventions for young adult hookah smokers. This randomized controlled trial (NCT03595280) tested the efficacy of a mobile multimedia messaging service intervention for promoting cessation in young adult hookah smokers. **Methods:** Hookah smokers aged 18-30 years were randomized to a control (no intervention), untailored intervention, or tailored intervention arm. Both intervention arms received a 6-week mobile multimedia messaging service (i.e., text and images) intervention conveying risks of hookah use and behavioral strategies for quitting. Unlike the untailored arm, the tailored arm message content was personalized to baseline hookah smoking frequency, risk beliefs, and responses to interactive text messages about hookah tobacco beliefs and behavior during the intervention. Risk appraisals, motivation to quit, cessation, and hookah smoking frequency were assessed at 6 weeks, 3 months, and 6 months. **Results:** In total 349 participants were eligible, completed baseline, and randomized (M age 24.1, 58% non-white, 54% female); 91% (n=319) were retained at 6 months. At 6 weeks, risk appraisals (M 4.2, SE 0.12 vs. M 3.8, SE 0.12, p = .04) and motivation to quit (M = 4.1, SE = 0.20 vs. M = 3.1, SE = 0.18, p = .007) were significantly higher in the tailored intervention arm than the control arm. At 6 weeks, cessation was significantly higher in the untailored (24% OR 2.77, 95% CI 1.32, 5.83) and tailored (22% OR = 2.45, 95% CI = 1.15, 5.22) intervention arms than the control arm (10%). At 6 months, cessation was significantly higher in the tailored (49%) than the control arm (29%; OR 2.36, 95% CI 1.33, 4.15) and past 30 day hookah smoking frequency was significantly lower in the tailored (M 3.5 days) than the control arm (M 4.3 days, p = .006). **Conclusions:** Our mobile messaging intervention is effective for promoting cessation in young adult hookah smokers. The individually tailored intervention produced sustained effects on cessation and reductions in hookah use frequency at the 6 month follow-up.

FUNDING: Federal

PH-70

ESTIMATING THE AGE OF INITIATION OF E-CIGARETTE USE OUTCOMES IN A NATIONALLY REPRESENTATIVE SAMPLE OF USA YOUNG ADULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2017

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Significance: Adverse health outcomes and safety concerns from e-cigarette use have been reported among young people due to the nicotine and toxic chemicals found inside vaping solutions. There is a lack of research on estimating the age of initiation of e-cigarette use among young adults (18-24 years old). **Methods:** Secondary analyses



among young adults (ages 18-24) from the PATH study in waves 1-4 (2013-2017) were conducted. Never e-cigarette users ($n = 7,360$; $N = 25,454,121$) at the wave they reach 18 (waves 1-3) were included. We estimated the age of first reporting (initiation) of three outcomes: (i) ever use, past 30-day use, and fairly regular e-cigarette use. We added the participants' age at their first PATH wave of adult participation (waves 1-3) to the number of weeks between relevant subsequent waves (waves 2-4) based on when the outcome was first reported for those who become users, or the last report of never/non-use among those who did not report the behavior. Weighted interval-censored survival methods, and weighted interval-censored Cox-proportional regression models were used to estimate the hazard function and to assess differences in the age of initiation of each e-cigarette use outcome by overall, by sex and by race/ethnicity. **Results:** Among young adults who never used e-cigarettes by the time they reached age 18, 8.3%, 2.9%, and 1% reported ever, past 30-day and fairly regular e-cigarette use by age 19, respectively. By age 21, 16.8%, 7.2% and 2.3% reported ever, past 30-day, and fairly regular use, respectively. Males had increased risks of first reporting ever, past 30-day, and fairly regular e-cigarette use at earlier ages than females. Hispanic young adults had increased risks of first reporting ever and past 30-day e-cigarette use at earlier ages compared to Non-Hispanic White young adults. **Conclusion:** Communication campaigns on nicotine addiction and health risks from e-cigarette use are needed in young adults. The results in this paper should be compared with estimates from surveys implemented after December 2019 to evaluate the efficacy of the federal Tobacco 21 law.

FUNDING: Federal

PH-71

SOUIDEMOGRAPHIC, CIGARETTE DEPENDENCE, AND QUIT SMOKING ATTEMPT DIFFERENCES BETWEEN EXCLUSIVE DAILY SMOKERS AND DAILY SMOKERS WHO REGULARLY USE CANNABIS. FINDINGS FROM THE 2018 INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY AND VAPING SURVEY

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Significance: Cigarette smokers who also regularly use cannabis (co-users) constitute a unique subset of smokers who differ from cigarette-only smokers. This study examined: (1) the proportion of daily smokers who do not use cannabis and those who are regular co-users; (2) sociodemographic, dependence, and quit attempt differences between exclusive smokers and co-users from countries with differing cannabis policies. **Methods:** Data are from the 2018 ITC 4CV Survey of adult (18+) daily cigarette smokers from Canada, United States (US), Australia, and England. In 2018, Canada and the US had less restrictive cannabis policies than Australia and England. Respondents were included if they were exclusive daily smokers or regular co-users (smoked cigarettes daily and also used cannabis at least weekly) ($N = 7202$). Occasional cannabis users were excluded. All estimates are weighted and adjusted. **Results:** 1266 daily smokers (18.0%) co-used cannabis (11.6% daily; 6.4% weekly), with 82.0% not using cannabis at all ($n = 5936$). Co-use was higher in Canada (23.7%) than in the US (19.1%, $p = 0.02$), England (12.4%, $p < 0.0001$), and Australia (9.8%, $p < 0.0001$). Co-use in the US was higher than in England ($p < 0.0001$) and Australia ($p < 0.0001$). Co-users were more likely than exclusive daily smokers to: be male (63.5% vs. 50.7%, $p < 0.0001$), be younger (18-39: 61.7% vs. 40+: 32.6%, $p < 0.0001$), have lower education (37.5% vs. 33.3%, $p = 0.04$), have been a daily smoker for ≥ 5 years (89.7% vs. 84.4%, $p < 0.0001$), have their first cigarette ≤ 5 minutes after waking (25.4% vs. 19.0%, $p < 0.001$), and perceive themselves as very/extremely addicted to cigarettes (61.4% vs. 56.5%, $p = 0.03$). Co-users and exclusive daily smokers did not significantly differ in urges to smoke, plans to quit smoking, or having made a quit attempt (ever, or in the in the last 18 months). **Conclusion:** In 2018, regular co-use was more common in countries with more permissive cannabis regulations, consistent with historical trends. Co-users are more cigarette-dependent than smokers who do not use cannabis, but are similar in their history of quit attempts, and in their intentions to quit smoking.

FUNDING: Federal; Academic Institution

PH-72

ESTIMATION OF THE AGE OF INITIATION OF HOOKAH USE AMONG YOUNG ADULTS IN THE USA USING THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVES 1-4 (2013-2017)

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Objective: Hookah use has been associated with lung, bladder, and gastro-intestinal malignancies, in addition to hematological and cardiovascular impairments. This study reports the prospectively estimated age of initiation of ever, past 30-day, and fairly regular hookah use. **Methods:** Secondary data analyses of the first four waves (2013-2017) of the PATH study, a nationally representative longitudinal cohort study of US young adults (ages 18-24). Young adult never hookah users at the first wave of participation in PATH waves 1-3 (2013-2016) were tracked up into waves 2-4 (2014-2017) to estimate the age of initiation of three outcomes: (i) ever use, (ii) past 30-day use, and (iii) fairly regular hookah use. Weighted interval-censored survival methods and interval-censored Cox regression models were implemented to estimate the age of initiation of each hookah use outcome, and to estimate differences in the hazard function by sex and race/ethnicity, respectively. **Results:** Overall, 5.8%, 2.7%, and 0.5% of these young adults reported initiation of ever, past 30-day and fairly regular hookah use by age 19. By age 21, 10.5%, 4.7% and 1.2% reported initiation of ever, past 30-day and fairly regular hookah use, respectively. By age 27, 22.6%, 12.1% and 2.4% reported initiation of ever, past 30-day and fairly regular hookah use, respectively. Young adults being male, Hispanic or Non-Hispanic Black were at a higher risk of initiating ever, and past 30-day hookah use at earlier ages than female and Non-Hispanic White young adults. Young adults being male or Hispanic were at a higher risk of initiating fairly regular hookah use at earlier ages than female and Non-Hispanic White young adults. **Conclusion:** Robust communication campaigns for young adults on the high levels of toxins, health risks, and nicotine addiction from hookah use are warranted. Because hookah use is a social activity, exploring the impact of social norms, social media, perceptions of harm, or perceptions of addiction, etc. among young adults who did not initiate in their adolescent years should be conducted in the future.

FUNDING: Federal

PH-73

QUIT SMOKING AIDS AND CONFIDENCE IN STAYING QUIT AMONG A SAMPLE OF RECENT EX-SMOKERS: FINDINGS FROM THE 2018 INTERNATIONAL TOBACCO CONTROL FOUR COUNTRY AND VAPING SURVEY

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Significance: In some countries, e-cigarettes (ECs) are the most commonly used quit-smoking aid. This study examined ex-smokers from four countries who quit smoking in the last 18 months, and explored what aid(s) they used at their last (successful) quit attempt (LQA): EC, nicotine replacement therapy (NRT: gum/patch), stop-smoking medication (SSM: varenicline/bupropion), another type of aid (quit-lines/websites/stop-smoking clinic/counselling), or no aid. Ex-smokers who used an EC at LQA vs. those who did not use an EC were compared on sociodemographic factors and confidence that they had quit smoking for good. As EC policies vary across the four countries, between-country comparisons were also conducted. **Methods:** Data are from the 2018 ITC 4CV Survey and included 1041 adult ex-smokers in Australia, Canada, England, and the US. All were past-daily smokers who reported having quit smoking 1-18 months prior to



completing the 2018 online survey. All estimates are weighted and adjusted. **Results:** Overall, 28.0% of ex-smokers used an EC at their LQA (24.7% used an EC only), 16.6% used NRT (11.2% used NRT only), 8.9% used SSM (2.1% used SSM only), 12.0% used another type of aid (2.7% used another aid only), and 37.2% quit smoking without an aid. Having used an EC to quit was significantly more likely by younger (age 18-39: 35.9% vs. older (age 40+: 20.8%, $p < 0.0001$) ex-smokers. Ex-smokers from England (42.4%) and Australia (33.3%) were significantly more likely to have quit using an EC compared to Canada (20.0%) and the US (18.9%). There were no significant differences between England and Australia ($p = 0.16$). Compared to ex-smokers who did not use an EC to quit, those who did were more likely to report being extremely/very confident that they will stay quit (69.7% vs. 79.1%, $p = 0.03$). Among those who used an EC to quit ($n = 423$), there were no differences between countries in ex-smoker's confidence in staying quit ($p = 0.79$). **Conclusions:** Just over one-third of ex-smokers did not use an aid to quit smoking, and among those who did use an aid, more quit with an EC than NRT and SSM, particularly in England. Additionally, ex-smokers who used an EC to quit appear to be more confident in staying quit.

FUNDING: Federal; Academic Institution

PH-74

AGE OF INITIATION OF CIGARILLOS AMONG YOUNG ADULT IN THE UNITED STATES 2013-2017

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Significance While youth have been the primary targets of preventive interventions, young adults are legal targets of tobacco companies, and the potential for cigarillo initiation remains a risk in this age group. It is essential to estimate the age of initiation of cigarillo use in young adults to inform intervention efforts to reduce abuse liability of cigarillos. **Methods** Survival analyses of the Population Assessment of Tobacco and Health (PATH) young adult annual dataset (ages 18-24) from 2013-2017 were conducted. Young adult never cigarillo users ($n = 7,101$; $N = 24,023,488$) at their first wave of adult (i.e., when they first turn 18) PATH participation (2013-2016) were followed up to 2014-2017 to estimate age of initiation of cigarillo use outcomes. Weighted interval-censored survival methods were used to estimate the age of initiation for 3 outcomes: ever, past 30-day and fairly regular cigarillo use. Differences by sex and by race/ethnicity were assessed using the weighted interval-censored Cox proportional hazards models. **Results** Among PATH young adults, by age 21, 5.8% initiated ever cigarillo use, 4.1% initiated past 30-day cigarillo use, and 1.4% initiated fairly regular cigarillo use. By age 26, 15% initiated ever cigarillo use, 10.4% initiated past 30-day cigarillo use, and 15.3% initiated fairly regular cigarillo use. Males had higher risk of initiating ever and past 30-day cigarillo use at earlier ages than females. Non-Hispanic Blacks had higher risk of initiating ever, past 30-day and fairly regular cigarillo use at earlier ages than non-Hispanic Whites. Hispanics had higher risk of initiating past 30-day cigarillo use at earlier ages than non-Hispanic Whites. Non-Hispanic Other race had lower risk of initiating ever and past 30-day cigarillo use at earlier ages than Non-Hispanic Whites. **Conclusion** Before the age of 21, cigarillo use interventions should target young adults, specifically males, non-Hispanic Blacks and Hispanics to stall initiation and progression of cigarillo use behaviors.

FUNDING: Federal

PH-75

THE ASSOCIATION OF EXPOSURE TO AND ENGAGEMENT WITH TOBACCO-RELATED SOCIAL MEDIA CONTENT AND THE AGE OF INITIATION OF E-CIGARETTES AMONG USA YOUTHS IN 2013-2017

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Objective In 2019, Facebook, Instagram, and Snapchat updated their policies to prohibit brand advertisements and user-generated content for the sale of tobacco and e-cigarettes. Tobacco users and influencers can still upload their own posts, photos, or videos of themselves using and promoting these products. **Methods** Analyses from 2013-2017 of the Population Assessment of Tobacco and Health youth dataset (ages 12-17; $n = 12,701$; $N = 23,313,039$) were carried out. Age of initiation was prospectively estimated among non-users of e-cigarettes using participant age in 2013-2014, calendar week/year of survey participation, and the number of weeks between the last report of

never use and the first report of ever e-cigarette use between 2014-2017. Participants included wave 1 youth who participated in wave 2, new wave 2 youth participants, and wave 1 youth who turned 18 at wave 2. Weighted interval-censored survival functions overall and by sex are reported. In 2014-2015, two potential risk factors for e-cigarette initiation were assessed: (i) "In the past 12 months, have you seen any tobacco-related content on social media sites?", and (ii) "In the past 12 months have you posted content about tobacco products on any social media sites?". Hazard ratios (HR) and 95%CI were estimated. **Results** Overall, 24% ($N = 5,647,835$) of youth initiated e-cigarettes between 2014 and 2017. Cumulatively, we found that 13% of youth initiated e-cigarettes by age 15, 20% by age 16, 32% by age 17, 44% by age 18, and 49% by age 20. The HR of initiating e-cigarettes is 1.536 times higher in participants who had seen tobacco-related content on social media as compared to participants who had not seen tobacco-related content on social media (95%CI: 1.533- 1.539). The HR of initiating e-cigarettes was 1.782 times higher in participants who have posted tobacco-related content on social media as compared to those who did not (95%CI: 1.776- 1.788). **Conclusion** Exposure to and engagement with social media content specific to tobacco increases the risk of initiating e-cigarette use at younger ages among youth. Stronger policy-based solutions are needed to reduce tobacco-related content on social media.

FUNDING: Federal

PH-76

THE AGE OF SUSCEPTIBILITY TO TOBACCO PRODUCT USE AMONG YOUNG ADULTS IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVES 1-4 (2013-2017)

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Objective Understanding at what age young adults become susceptible to tobacco product (TP) use will help to target prevention efforts at the appropriate ages to stall abuse liability of these products. This study prospectively estimates the age of onset of susceptibility to use cigarettes, e-cigarettes, hookah, cigarillo, and smokeless tobacco. **Design** Secondary data analyses of the PATH study, a nationally representative longitudinal cohort study of US young adults (ages 18-24). **Methods** Young adults who were not susceptible to each TP at either waves 2-3 in PATH (2014-2016) were followed-up into waves 3-4 (2015-2017) to prospectively estimate the age of onset of susceptibility to use each TP. Weighted interval-censored survival methods and interval-censored Cox regression models were implemented to estimate the age of first report of susceptibility to use of each TP, and to estimate differences in the hazard function by sex and race/ethnicity. **Results** By age 21, 12.4%, 16.0%, 16.5%, 5.5%, and 5.9% of young adults reported onset of susceptibility to cigarettes, e-cigarettes, hookah, cigarillo, and smokeless tobacco, respectively. Females had a higher risk of onset of susceptibility to cigarillo at earlier ages than males. Males had a higher risk of onset of susceptibility to smokeless tobacco at earlier ages than females. Hispanics had a higher risk of onset of susceptibility to cigarillo and smokeless tobacco use at earlier ages than non-Hispanic Whites. Non-Hispanic Blacks had higher risk of onset of susceptibility to cigarette, hookah, and cigarillo use at earlier ages than non-Hispanic Whites. Non-Hispanic Other race had higher risk of onset of susceptibility to e-cigarette and cigarillo use at earlier ages than Non-Hispanic Whites. **Conclusion** With the changing landscape of tobacco products, monitoring the age of onset of susceptibility of tobacco product use longitudinally is critical to prevent initiation. Communication campaigns for each tobacco product that are tailored to address socio-demographic and cultural differences may be beneficial to preventing tobacco product use among young adults.

FUNDING: Federal

PH-77

THE RECALLED AGE OF INITIATION OF TOBACCO PRODUCTS AMONG ADULTS 26-34 YEARS OLD USING THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVE 1 (2013-2014)

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Objective With the change in the tobacco marketplace that has increased the popularity of alternate products, we sought to estimate the recalled age of initiation of (i) e-cigarette, (ii) cigarillo, (iii) traditional cigar, (iv) filtered cigar, (v) hookah, and (vi) smokeless tobacco use among U.S. adults 26-34 years old. **Methods** Six secondary analyses were conducted in the adult restricted dataset among participants who were users of at least



one of the six tobacco products (TP) in 2013-2014, who reported their recalled age of initiation of each TP, and reported never, current, or former cigarette use. Weighted summary statistics are reported using the balanced repeated replication (BRR) method to account for PATH's complex design. Six histograms for the overall recalled age of initiation for each TP are reported. Weighted Cox proportional hazard models were fitted exploring differences in the recalled age of initiation of each TP by sex, race/ethnicity, and by cigarette smoking status. **Results** The distribution of the recalled age of initiation of e-cigarettes showed three peaks at 24-25 (10.8%), 25-26 (11.4%), and 27-28 (12.5%) years old; cigarillos, traditional cigars, filtered cigars and smokeless tobacco all showed three peaks at 15-16 (11%-12.7%), 17-18 (14.7%-19.6%), and 19-20 (6.9%-12.5%) years old; and hookah showed three peaks at 17-18 (13.4%), 19-20 (9.8%), and 24-25 (10.3%). The risk of recalling the age of initiation of e-cigarettes, cigarillo, traditional cigars, filtered cigars, and hookah at earlier ages was higher for males than for females (8%-46%). Differences in the recalled age of initiation of each TP by race/ethnicity were observed for all TPs, except for e-cigarettes. There were statistically significant differences for the recalled age of initiation of cigarillos, traditional cigars and hookah by cigarette smoking status. **Conclusion** Preventing TP use requires interventions across youth (12-17), young adults (18-24) and adults (25-34). Estimating the age of initiation prospectively is imperative for tobacco regulatory science.

FUNDING: Federal

PH-78

ESTIMATION OF THE AGE OF INITIATION OF CIGARETTES AMONG U.S. YOUNG ADULTS USING FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) WAVES 1-4 (2013-2017)

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Objective Despite the harmful health effects of cigarette use, its nicotine dependence, and interventions to reduce cigarette initiation, there are many young adults (18-14) who do not initiate cigarette use during adulthood. We sought to prospectively estimate the age of initiation of cigarettes use outcomes among young adult never users and explore differences in their age of initiation by sex and race/ethnicity. **Methods** Secondary analyses of the PATH young adult restricted dataset, waves 1-4 (2013-2017), were conducted. We estimated the hazard function as cumulative probabilities for the age of initiation of ever, past 30-day, and fairly-regular cigarette use. Weighted summary statistics are provided using the Balanced Repeated Replicate (BRR) weights to account for PATH's complex study design. Weighted interval-censoring survival analyses and weighted interval-censoring Cox proportional regression models were conducted. **Results** By age 19, 6%, 4% and 0.9% of young adults who were never cigarette users at the first PATH wave of adult participation in 2013-2016 initiated ever, past 30-day and fairly-regular cigarette use in 2014-2017, respectively. By age 21, 10.6%, 7.7% and 1.9% of young adults initiated ever, past 30-day and fairly-regular cigarette use. By age 26, 4.4% of young adults initiated fairly-regular cigarette use. By age 28, 28.4%, and 22.2% of these young adults initiated ever and past 30-day cigarette use. Males have 77%, 83%, and 82% higher risk of initiating ever, past 30-day and fairly-regular cigarette use at earlier ages than females, respectively. Hispanics have 53% and 62% higher risk of initiating ever and past 30-day cigarette use at earlier ages than Non-Hispanic Whites. Non-Hispanic Blacks have 34% higher risk to initiate past 30-day cigarette use at earlier ages than Non-Hispanic Whites. Non-Hispanic Others have 67% lower risk to initiate fairly-regular cigarette use at earlier ages than Non-Hispanic White young adults. **Conclusion** Despite cigarette interventions there is still a large percentage of young adults engaging in cigarette use outcomes from young adult to adulthood.

FUNDING: Federal

PH-79

VERY LOW NICOTINE CONTENT CIGARETTE EFFECTS ON CUE-PROVOKED CRAVINGS: PRELIMINARY FINDINGS FROM AN ONGOING RANDOMIZED CONTROLLED

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Background: Very low nicotine content (VLNC) cigarettes have potential for smoking cessation by rendering cigarettes less satisfying when combined with a behavioral extinction process. The method of Brandon et al. (2018) was adapted to facilitate ex-

tingtion of cue-provoked cravings via smoking VLNC cigarettes prior to a quit day (i.e., maintain smoking rate and systematic pairing of VLNC cigarettes with smoking cues). A cue reactivity task assessed the effects of VLNC cigarettes and facilitated extinction (FE) techniques on cue-provoked cravings. We report changes in cue reactivity after 5 weeks of VLNC use, and as a function of FE using preliminary data from an ongoing randomized controlled trial (RCT). **Methods:** Seventy-one participants were randomly assigned to one of four conditions crossing FE techniques vs. a standard treatment with immediate vs. gradual reduction to the lowest nicotine levels. A validated picture-viewing cue reactivity paradigm was administered at baseline (Visit 1) and at the end of a 5-week pre-cessation treatment period (Visit 6). 12 smoking-related and 12 neutral images were randomly presented to each participant as craving ratings were obtained. Generalized Estimating Equations (GEE) examined effects of intervention (FE vs. Standard), time (Visit 1 vs. Visit 6), and cue type (Smoking vs. Neutral). To preserve blinding, nicotine reduction schedules were not examined at this time. **Results:** Participants' mean age was 51.8 years, 61.9% were female, mean number of cigarettes per day was 19.6, and average nicotine dependence (FTND) score was 5.6. Robust cue reactivity was observed across sessions (Smoking > Neutral, $p < .0001$), with this effect significantly reduced at Visit 6 (cue type \times time, $p < .0001$). Those in the FE treatment group did not differ from those in the standard group in cue reactivity at Visit 6 ($p > .05$). Additional analyses found baseline FTND positively predicted average craving during smoking cues at Visit 1 ($r = .27$, $p < .05$), but not at Visit 6 ($r = .04$). **Conclusions:** Cue-reactivity (cravings in response to smoking vs neutral cues) decreased as expected over the course of treatment, perhaps reflecting the hypothesized extinction via use of VLNC cigarettes. However, the addition of specific extinction advice did not appear to facilitate this process, suggesting that VLNC cigarettes alone may be sufficient. Future analyses will examine if the nicotine reduction schedule affects cue reactivity, and ultimately cessation outcomes.

FUNDING: State

PH-80

NICOTINE CONCENTRATIONS OF E-LIQUIDS WITH AND WITHOUT NICOTINE SALTS

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Significance: Protonated nicotine (i.e., nicotine salts) is formed when free-base nicotine is mixed with an acid to neutralize nicotine's alkalinity. According to tobacco industry documents, when nicotine salts were invented in 1973 the purpose was to addict youth. An R.J. Reynolds researcher reasoned that salts would allow for increased smoke and nicotine delivery, thereby increasing enjoyment without the traditional harshness of nicotine. E-cigarette manufacturers claim salts are used to better satisfy cravings. We examine the nicotine concentrations in e-liquids by type of nicotine formulation (salt vs free-base) used by regular e-cigarette users. **Methods:** 256 adult (21 years and older) regular e-cigarette users (5+ days of use per week) completed the baseline survey of the Vaping and Patterns of E-cigarette use Research Study (VAPER Study). Participants were recruited from 40 US cities between May and July 2020 using social media and Craigslist ads. Participants were asked to submit a photo of their most commonly used e-liquid container. Nicotine concentration and the formulation were coded by reviewing the content of product photos and corresponding manufacturer, retail, review, and academic sites. Group comparisons were conducted using a t-test. **Results:** Of the 256 participants, 118 submitted photos of e-liquid products with sufficient detail to ascertain nicotine concentration and formulation (46%). 51% of these participants were using e-liquids with salts (n=60) whereas 49% were using free-base nicotine (n=58). Among those using salts, nicotine concentrations ranged from 3 to 59 mg/ml, with a median of 50 mg/ml (48% used 50 mg/ml). Conversely, among those using free-base nicotine, concentrations ranged from 3 to 27 mg/ml; the median was 4.5 mg/ml (86% used 3 or 6 mg/ml). The mean difference between the two groups was significant ($p < 0.0001$). **Conclusion:** To the best of our knowledge, this is the time first that the range and median of nicotine concentrations by formulation have been described, as used "in the wild". Our results suggest nicotine salts are used by adults who are regular e-cigarette users, and those using salt-containing e-liquids were vaping nicotine concentrations nearly 17-fold higher on average than those using free-base nicotine-containing e-liquids. It will be important to study the impact of nicotine salts on dependence, initiation among youth, and cessation among smokers trying to quit, as well as other health impacts.

FUNDING: Federal



PH-81

MOBILE INTERVENTION FOR FAMILY SMOKING CESSATION IN ROMANIA-EXIT INTERVIEWS

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Significance: Smoking rates before and during pregnancy are high in Romania and other low and middle income countries. mHealth interventions using apps hold the promise of harnessing the functionality of smartphones to reduce smoking during pregnancy and postnatal relapse. Integrating app user feedback in app updates may increase engagement and effectiveness of pregnancy tobacco cessation apps. **Methods:** Twenty participants (12 women and 8 partners) in the Smoke Free Together app-based smoking cessation intervention who used the mobile app were invited to in-depth semi-structured exit interviews. The interview guide focused on a general discussion about the apps used by the participants, on the user experience with the Smoke Free Together app, on the notifications received and on potential strategies to increase engagement and retention in the app. The interviews lasted between 20-60 minutes, were audio recorded, transcribed verbatim and analyzed using NVivo. **Results:** Most of the women mentioned that they used the app's panic button, the information in the app, the journal and the function of establishing a quit date. Regarding the suggestions to improve the app, 3 women mentioned the need of an online counselor and 4 women recommended an online forum. All the women liked the ideas of receiving in-app incentives such as a certificate of completion or further options to personalize the app, such as changing the profile color. Regarding notifications, the majority suggested to receive one per day, in the morning. Women suggested the notifications to be personalized and to remind them about their status in the app. Others suggested including testimonials of participants who successfully quit smoking. The majority of the partners used the Smoke Free Together app module for helping their partner to quit and stated that the app was easy to use and the content was useful. **Conclusion:** The exit interviews provided information that may increase the engagement and retention in Smoke-Free Together app, with the ultimate goal of reducing pregnancy smoking and postnatal relapse.

FUNDING: Federal

PH-82

RELATIVE IMPORTANCE OF E-CIGARETTE CHARACTERISTICS AMONG YOUNG ADULTS WHO VAPE: FINDINGS FROM A NOVEL MAXIMUM DIFFERENCE CHOICE TASK

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SIGNIFICANCE. Understanding the relative importance of both e-cigarette device and e-liquid characteristics among young adults who vape is essential for informing tobacco regulatory policies. **METHODS.** An online panel of young adults who vape (N=572) completed an iterative best-worst scaling task in which they selected the product characteristics that were most and least important to them (e.g., brand, price, e-liquid flavors and nicotine level, among others). A maximum difference choice analysis scaled and estimated the relative importance of each product characteristic and latent class analysis (LCA) identified groups of individuals with similar device and e-liquid preferences. **RESULTS.** Overall, price (11.3%), strength of hit (11.1%), and type of device (9.5%) were considered the most important device characteristics, while flavor (11.1%), nicotine level (10.8%), and price (10.5%) were the top e-liquid characteristics. LCA identified 5 groups with distinct preferences: (1) "Price" (n=219) considered price of device (16.9%) and price of e-liquid (15.7%) as most important; (2) "Customizability" (n=134) considered e-liquid characteristics such as nicotine level (12.7%) and flavor (11.3%) most important, as well as compatibility with preferred nicotine formulation (11.0%) and customizable temperature/voltage (10.3%); (3) "Brand" (n=89) considered device type (14.3%) and brand (12.5%) to be most important; (4) "Nicotine" (n=65) preferred nicotine level and strength of hit the most, and did not highly value device price (2.7%) or e-liquid price (2.3%); (5) "Novice" vapers (n=65) were only concerned with device price (10.3%), and were neutral on all other product characteristics. **CONCLUSIONS.** Strength of hit, nicotine level of e-liquid, and flavor often surpassed price as more important e-cigarette characteristics in this sample of young adults who vape. These findings highlight that

different groups of individuals value different e-cigarette characteristics. Potential targets for regulatory policies and prevention efforts must consider how such efforts will differentially impact various types of vapers.

FUNDING: Federal

PH-83

IDENTIFYING PATTERNS OF TOBACCO USE IN MIDDLE AND HIGH SCHOOL STUDENTS IN THE DOMINICAN REPUBLIC: A LATENT CLASS ANALYSIS

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The Dominican Republic (DR) is still in the early stages of tobacco control, with no national strategy for youth tobacco use prevention. 7.7% of middle school and high school students are current tobacco users, and 22.6% have ever used tobacco products. This study seeks to understand current patterns of use in Dominican youth using Latent Class Analysis (LCA) to inform prevention intervention. **Methods:** We analyzed the DR's 2016 Global Youth Tobacco Survey dataset (GYTS; N=1,532), a school-based cross-sectional survey that employs a two-stage clustered design to obtain a national representative sample. For the LCA, we included indicators of cigarettes, shishas, smokeless tobacco, and e-cigarettes. Two indicators were used for each product, one for ever use (yes/no) and another for use in the last 30 days (yes/no). To analyze predictors of class membership, we conducted a multinomial regression with the covariates. For covariates, we included gender (male/female), age ("under 14 years" or "15 or older"), and average spending money ("none to 199 pesos" or "200 - 9999 pesos"). **Results:** A five-class solution was best-fit to the data: Non-Users (NU; 58%), Shisha Experimenters (SE; 22%), Poly-Users (PU; 14%), Smokeless Tobacco with Experimentation (STE; 4%), and Cigarette with Experimentation (CE; 2%). The regression analyses showed that male students are more likely to be in the PU (OR= 1.94, 95% CI: 1.12-3.94), SE (OR= 1.97, 95% CI: 1.52-2.55) and CE classes (OR= 4.19, 95% CI: 1.12-15.71) than the NU class. Older students were more likely to be in the PU (OR= 2.27, 95% CI: 1.44-3.58) and STE classes (OR= 2.22, 95% CI: 1.12-4.42) than the NU class. Students with more spending money were more likely to be in the SE class (OR= 1.79, 95% CI: 1.27-2.51) than the NU class. **Discussion:** Our findings indicate that most tobacco users belong to the SE or multiple product experimenters/user classes. Targeting prevention messages toward shisha users, boys and older students, and policies that institute taxes across tobacco products should be prioritized. Collectively, this suggests more efforts are needed to prevent experimentation across multiple products.

FUNDING: Unfunded

PH-84

USE, AWARENESS, AND PERCEPTIONS OF NOVEL TOBACCO PRODUCTS AMONG THE DUTCH POPULATION OF 13 YEARS AND OLDER

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Significance: Last years, many new tobacco and related products (NTRP) have emerged on the market, with unknown health risks. Examples include heated tobacco products (HTPs), new types of electronic cigarettes (fourth generation) using cartridges with flavors and nicotine salts (i.e. pod mods), tobacco-free nicotine pouches, and flavored steam-stones to be used in a waterpipe. Moreover, some traditional tobacco products, such as cigarillos, may have increased in popularity as a consequence of more restrictive regulation of cigarettes. In order to estimate their risks at population level, it is important to know more about use, awareness, and perception of these products. For policy making, use and popularity of these products in adolescents and young adults is of special interest as they may function as gateway to smoking and have harmful properties. **Methods:** An ISO certified research agency (Kantar) conducted an online survey among 5000 participants aged 13 and older representative for the Dutch population in terms of gender, age, education, urbanization, and social economic status. After providing informed consent, participants were shown an image of each of the five products and indicated whether they know or have used it. Next, participants who were familiar with a product (users and non-users), were selected to answer further questions about their reasons for use, attitudes and risk perception of that product. Descriptive statistics are applied to analyze survey outcomes. **Results:** Data will show the user profiles of users of the four NTRP and cigarillos. Moreover, reasons for using or not using the product, risk perceptions, attitudes, and social influences among both users and non-users (who are familiar with the product) will be described. **Conclusion:** This



survey provides insight in awareness, use, and reasons for use about four NTRP and cigarillo's in The Netherlands. Our results will help public health professionals and policy makers to develop targeted communication and product regulation measures. Given that popularity and target groups of such products may quickly change, this study should be repeated with regular time intervals to monitor such changes.

FUNDING: State

PH-85

INTEREST IN MINDFULNESS BASED SMOKING CESSATION INTERVENTIONS AMONG LOW-INCOME HIV INFECTED SMOKERS

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Objectives: Mindfulness-based interventions show promise in promoting smoking cessation in diverse populations. No published research has examined mindfulness for smoking cessation in low-income HIV-infected smokers. This study investigates this group's previous experience with mindfulness and its interest in learning about its benefits and use to quit smoking. **Methods:** We conducted a cross-sectional survey among HIV-infected smokers (n=170; 50.6% females; mean age [SD] = 51.6 [9.98] years; response rate 77.9%) receiving care at an academic institution. The survey assessed demographics, smoking history, experience with mindfulness, willingness to learn about its benefits, willingness to use it to reduce stress and quit smoking, and preferred delivery method (e.g., in-person, phone, internet, app, video). Descriptive analyses of primary indices were tabulated and differences by gender were assessed using Chi-square tests and between-group t-tests. **Results:** Most participants were minorities (66.5% non-Hispanic black; 20.6% Hispanic) with less than high school education (55.0%) and less than \$10,000 in annual income (80.6%). Nicotine dependence was high in 35.3% of participants and 74.7% were daily smokers. A quarter (25.3%) had moderate to severe depression and 40.1% reported risky alcohol use. Compared to men, women were more likely to have lower income (90.7% vs. 70.2%; p=0.002) and to be depressed (32.6% vs. 17.9%; p=0.03). Overall, 27.6% of participants had previous experience with mindfulness; among these, 87.5% reported having a positive experience. Most participants were willing to learn about the benefits of mindfulness in quitting smoking (71.4%), and to practice mindfulness to manage stress (70.6%) and to quit smoking (71.8%). The preferred method for receiving mindfulness interventions was in-person training (60.6%). **Conclusions:** Results suggest that low-income minority HIV-infected smokers are interested in receiving in-person mindfulness-based smoking cessation interventions. Given the potential of mindfulness to promote smoking cessation, more studies are needed to explore the feasibility and potential efficacy of such interventions in this group.

FUNDING: Federal; Academic Institution

PH-86

PREDICTING ELECTRONIC CIGARETTE DEPENDENCE AND WITHDRAWAL AMONG NEVER-SMOKING ELECTRONIC CIGARETTE USERS: RESULTS FROM PATH WAVE 4

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Significance: Little is known about the dependence potential of electronic cigarettes (ECIGs), which vary greatly in their nicotine delivery ability. Differences across models may be due to device/liquid and/or user characteristics. Moreover, work that addresses ECIG dependence is based largely on users with a history of cigarette smoking. This analysis examined the influence of such characteristics on dependence and withdrawal in never-smoking ECIG users. **Methods:** Data were derived from Wave 4 of the Population Assessment of Tobacco and Health Study, using current ECIG users who smoked <100 cigarettes lifetime (n=720). Regressions examined individual ECIG features (e.g. nicotine, tank, cartridge) and user behaviors (e.g. uses/day) as predictors of dependence (sum of 16 items), withdrawal symptoms (sum of 7 items), and craving. One-way ANOVAs examined these outcomes based on ECIG characteristics categorized by device type (e.g. disposable, refillable tank). Analyses controlled for demographic factors (e.g. race, age). **Results:** Using ECIGs with nicotine was associated with ECIG dependence

(B=.28, SE=.05), withdrawal (B=.23, SE=.08), and craving (B=.30, SE=.03), whereas nicotine concentration was associated with craving only (B=.30, SE=.04). As for user behaviors, greater ECIG use/day was associated with dependence (B=.14, SE=.05) and craving (B=.15, SE=.05); more puffs was associated with dependence only (B=.11, SE=.04); and greater past 30 day use was associated with withdrawal only (B=.25, SE=.10). Relative to disposables (M±SD; 24.1±14.2), dependence scores were higher among users of non-refillable cartridges (37.0±15.1), refillable tanks (32.1±4.6), and refillable mods (30.2±14.3) (ps<.05). Scores also were higher for users of non-fillable cartridges, compared to refillable tanks and refillable mods (ps<.05). **Conclusion:** Few ECIG characteristics predicted outcomes when considered individually, though dependence scores differed significantly when characteristics were considered by device type. User behavior also may be a reliable indicator of ECIG dependence. Future work should consider the evaluation of dependence features that may be unique to ECIGs.

FUNDING: Federal

PH-87

FACTORS ASSOCIATED WITH INTENTION TO USE WITH E-CIGARETTES AMONG NEVER TOBACCO: NATIONAL YOUTH TOBACCO SURVEY (2014-2018)

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Significance: There is limited data regarding the factors likely influencing e-cigarette use among youth who are considered at low risk of using tobacco products. To address this, we assessed the relationship between exposure to pro-tobacco advertisements, household member tobacco use, and their effects on intention to use e-cigarettes in youth who have never used any tobacco products. **Methods:** We examined factors associated with intention to use e-cigarettes among youth who have never used tobacco products by using the National Youth Tobacco Survey (2014-2018), a nationally representative school-based survey of middle and high school students in the US. Multivariate logistic regression models were fit to assess factors associated with youth intention to use e-cigarettes. **Results:** Of the sample (N = 57,717), 23% of respondents reported intention to use e-cigarettes in the future. Middle school students were most susceptible to having intentions to use e-cigarettes [adjusted odds ratio (aOR) = 1.23; CI: 1.16, 1.29] when compared to high school students. Those exposed to e-cigarette advertisements via the internet were more likely to have intention to use e-cigarettes (aOR = 1.32; CI: 1.26, 1.39) compared to respondents reporting no exposure. Compared to living in a household where no one used tobacco, living with household members who use e-cigarettes (aOR = 2.44; CI: 2.28, 2.59), other tobacco products (aOR = 1.40; CI: 1.34, 1.45), or both e-cigarettes and other tobacco products (aOR = 2.38; CI: 2.25, 2.51) were associated with having intention to use e-cigarettes. **Conclusions:** Being in middle school and other social environment factors seem to have a significant effect on intention to use e-cigarettes in youth at low risk of using tobacco products. Our findings underscore a critical need for identifying effective strategies to target youth prior to experimentation, to enforce regulatory actions pertaining to youth e-cigarette advertisement exposure, and advocate for nicotine free homes to help prevent future nicotine addiction.

FUNDING: Federal; State

PH-88

IMPACT OF AVAILABILITY AND REGULATION OF FLAVORED JUUL PODS ON ADULT USER BEHAVIORS

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Background: In an effort to curb increasing youth use, JUUL removed flavored pods from store shelves in October 2019, leaving flavored pods available only for online purchase. The United States Food and Drug Administration (FDA) later banned the sale of all flavored pods, including online, in February 2020. This study aimed to evaluate changes in JUUL user behaviors in response to changes in availability and regulation. **Methods:** Unique samples of current JUUL users (aged ≥18 years) were surveyed via Amazon Mechanical Turk in July 2019 (Wave 1 - Pre), January 2020 (Wave 2 - After removal from store shelves), and April 2020 (Wave 3 - After FDA ban). Participants were asked to report the flavored pod used most often in the past 30 days with their JUUL



device and to answer questions about purchasing and other behaviors. Means and frequencies were used to describe the sample while chi-square analysis and one-way ANOVA were used to determine differences in variables of interest by wave. **Results:** Three hundred and eleven participants met study inclusion criteria (n=76 (W1); n=143 (W2); n=92 (W3)). Overall, participants were 63.7% male with a mean age of 31.8 years (SD=8.27) (median=30) (range=18-67). Participants used JUUL an average of 8.5 times per day (SD=8.9) and more than half reported daily JUUL use (53.1%) (Mean=23.1 days out of 30). There were no significant differences for these demographics between waves. Over time, there was a significant decrease in the use of mint pods (43.4%, 21.0%, 15.2%) ($p<.01$), while there was a significant increase in the use of menthol pods (6.6%, 24.5%, 34.8%) ($p<.01$). Of interest, there was not a significant decrease in use of the popular banned flavor mango (14.5%, 7.7%, 10.9%, $p=.28$). In addition, there was a significant difference over time in the proportion of participants who reported refilling their pods (19.7%, 35%, 12.4%) ($p<.01$). **Conclusion:** While use of some flavored pods decreased, many users in our sample still reported use of flavored pods after they were banned, as well as refilling pods. Future research is needed to evaluate black market/bootleg sales and the potential impacts on users.

FUNDING: Academic Institution

PH-89

CHANGES IN SMOKING BEHAVIOUR AND HOME SMOKING RULES DURING THE INITIAL COVID19 PERIOD IN ISRAEL

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Significance The SARS-CoV-2 pandemic has caused devastating health, social and economic impacts globally. In order to mitigate potential health implications from the pandemic, Israel imposed severe restrictions during March-April 2020. The aims of this study were to explore changes in smoking behaviour and home smoking rules during the initial COVID19 period in Israel. **Methods** A national cross-sectional online survey was conducted in April 2020 among current and ex-smokers. Survey assessed smoking status, socio-demographic characteristics, perceptions of risks from Sars-CoV-2 infection, perceived stress levels, home smoking rules, and smoking patterns (among current smokers only). Bivariate analysis and multivariate logistic regression were performed to examine the association between socio-demographic characteristics and perceptions of risk of Sars-CoV-2 infection, and between quitting smoking during the initial COVID19 period. **Results** Out of 660 participants, 437 (66.2%) were current smokers, 46 (7%) quit during the restrictions, and 177 (26.8%) were ex-smokers. A negative change in home smoking rules was reported by 6.6%. Among current smokers, 44.4% reported smoking more, and 16% reported quit attempts during the restrictions period. Participants with a higher degree (adjusted OR 1.97, 95% CI 1.0, 3.8), those who were not living with a smoker (adjusted OR 2.18, 95% CI 1.0, 4.4), and those who have a chronic disease that places them at a higher risk for COVID19 complications (adjusted OR 2.32, 95% CI 1.1, 4.6), all had a significant association with quitting during the initial COVID19 period. **Conclusions** Both an increase in smoking behaviour, and an increase in attempts to quit smoking, during the initial period of COVID-19, were evident in this sample of adult Israeli smokers. Governments and health organizations need to use this opportunity to encourage more smokers to attempt quitting, and create smoke-free homes, while providing mental and social support to all smokers, regardless of their motivation to quit.

FUNDING: Unfunded

PH-90

EXCLUSIVE AND DUAL USE OF E-CIGARETTES AND MARIJUANA AMONG US YOUTH- ASSOCIATIONS WITH MEETING THE 5-2-1-0 OBESITY PREVENTION GUIDELINES

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Significance: Poor diet and physical inactivity is contributing to increased obesity among youth. Additionally, use of e-cigarettes and marijuana is also increasing and has been linked to poor diet among youth. These behaviors, especially if they continue into adulthood, are major contributors to preventable morbidity and mortality. In an effort to prevent obesity, the 5-2-1-0 guidelines were put forth. These daily guidelines recommend ≥ 5 servings of fruit and vegetables, ≤ 2 hours of screen time, ≥ 1 hour of physical activity, and 0 sugar-sweetened beverages. This study examined the exclusive and dual use of e-cigarettes and marijuana among youth, and its associations with meeting the 5-2-1-0 obesity prevention guidelines. **Methods:** Data from the 2017 Youth Risk Behavior Survey was analyzed (N=12,578). Participants reported their past 30-day e-cigarette and marijuana use. This data were used to classify participants into four categories:

non-users, exclusive e-cigarette users, exclusive marijuana users, and dual e-cigarette and marijuana users. Logistic regression models were conducted and adjusted for sex, race/ethnicity, grade level, and use of other tobacco products. **Results:** Of youth, 5.2% were exclusive e-cigarette users, 9.9% were marijuana users, and 7.8% were dual users. Less than 1% of participants met all four recommendations, 5.6% met three, 2.4% met two, 37.1% met one, and 36% did not meet any of the four recommendations. Compared to non-users, exclusive marijuana users and dual users were less likely to eat ≥ 5 servings of fruit and vegetables daily (OR=0.76, 95%CI=0.58-0.98 and OR=0.71, 95%CI=0.51-0.98 respectively). They were also less likely to meet the 0 sugar-sweetened beverage recommendation (OR=0.81, 95%CI=0.65-0.99; 0.63, 95%CI=0.46-0.87 respectively). Only exclusive e-cigarette users were more likely to engage in ≥ 1 hour of physical activity (OR=1.55, 95%CI=1.16-2.07) than non-users. In a sub-group analysis excluding non-users, exclusive e-cigarette users were more likely to meet the ≤ 2 hours of screen time recommendation (OR=1.47, 95%CI=1.1-1.97 compared to dual users). **Conclusion:** Prevention efforts are needed to reduce e-cigarette and marijuana use and increase adherence to daily obesity prevention guidelines among U.S. youth. **Learning objective:** Youth e-cigarette and marijuana use is associated with obesity risks, with higher pronounced odds in dual users.

FUNDING: Academic Institution

PH-91

APPROACH AND AVOIDANCE SENSITIVITY ASSOCIATED WITH SMOKING FLUCTUATIONS IN PRE-QUIT SMOKERS

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Objective: Motivation to quit smoking is an important predictor of quit success and enhancing motivation to quit smoking is a key component of several interventions. Previous research indicates that motivation to quit fluctuates over time. However, there is a dearth of empirical data about smoking fluctuations among pre-quit smokers. Here, we used ecological momentary assessment (EMA) to test interactions between approach/avoidance sensitivity, i.e. the propensity to adopt or avoid a target stimuli, and daily plan to abstain from smoking on daily cigarette smoking. **Methods:** Current smokers (n = 82; Mean 11.4 cigs/day; 46% Female; Mean 6.7 contemplation ladder) completed a baseline assessment, including a measure of approach/avoidance motivation (Behavioral Inhibition and Behavioral Activation Scales [BIS/BAS], assessing drive, responsiveness to reward, fun seeking, and behavioral inhibition), followed by 28-days of EMA. EMA included a morning assessment of abstinence plan, and evening assessment of cigarettes smoked. Multilevel linear models tested interactions between BIS/BAS and daily abstinence plan on daily cigarette smoking (defined as percent change from within-subject mean). All analyses controlled for contemplation ladder, nicotine dependence, morning negative affect, and study day. **Results:** There were significant interactions between abstinence plan and BIS (F[1, 645]= 6.777, $p<0.01$) and BAS Drive (F[1, 645]= 4.780, $p=0.029$) on daily cigarette smoking. Low BIS and high BAS Drive were each associated with greater changes in smoking depending on abstinence plan (i.e., reduced smoking during an abstinence day and heightened smoking on a non-abstinence day). That is, individuals with low BIS reduced smoking by 34%, and those with high BAS Drive reduced smoking by 19% when they indicated a daily abstinence plan. **Conclusion:** These data elucidate daily fluctuations in smoking among pre-quit smokers, and provides insight into motivational factors that may contribute to successful reductions in smoking. Future studies should examine whether relationships between approach/avoidance motivation and abstinence intentions during the pre-quit stage predict long-term smoking cessation.

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PH-92

COLLEGE STUDENTS QUITTING JUUL: MOTIVATIONAL FACTORS AND BEHAVIORAL INFLUENCES

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Introduction: JUUL, a high-nicotine electronic cigarette (e-cigarette) was the most popular vaping device among young adults in 2019. However, some young audiences may desire to quit using JUUL. We sought to explore factors that may motivate young adults to quit using JUUL. **Methods:** We used a sequential, mixed methods design to ask a sample of college students about their intention to quit using JUUL. To do this, we first recruited a sample (n=631) of participants to complete a cross-sectional online



survey that asked about factors that might influence them to quit using JUUL. Using a latent class analysis (LCA), we identified groups of participants who would quit using JUUL for various reasons. Participants were also asked 'Can you be too old to JUUL?' during the survey. Next, a subsample of survey participants (n=51) were invited to participate in one-on-one, in-person interviews. Interview participants were asked about their expectations for future use of JUUL, and after showing interviewees preliminary survey findings, they were asked about their perceptions of the data. Data were coded in NVivo, and themes were identified using a thematic analysis. All data were collected between March-April 2019. **Results:** The point of convergence between the quantitative and qualitative data were future intentions to quit using or reduce JUUL use and influence of one's social environment. The LCA identified four classes of people who were motivated to quit using JUUL by: costs to self (i.e., harm to lungs/brain, price; 46.8%), financial costs (36.6%), all costs (e.g., social, monetary, health; 9.3%), or harm to self (7.3%). Interviewees affirmed desires to quit using JUUL, especially after leaving college. Many participants believed their JUUL use was influenced by their social environment (i.e., college); thus, many expected or planned to quit using JUUL after transitioning to post-college environments (e.g., career, graduate school). Only 27.19% of survey participants reported an age threshold for using JUUL (M=31.8 years, SD=10.0); however, several interviewees explained that although someone could not be too old to JUUL, it would be 'immature' or 'childish' for adults who were not trying to quit smoking to use JUUL socially. **Conclusions:** Comprehensive tobacco control strategies such as taxing e-cigarettes, marketing campaigns, and nicotine cessation programs are needed to help nicotine dependent young adults to quit using high-nicotine e-cigarettes.

FUNDING: Academic Institution

PH-93

PREDICTORS OF HOUSEHOLD SECOND-HAND SMOKE EXPOSURE AMONG PREGNANT VIETNAMESE WOMEN

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SIGNIFICANCE: Second-hand smoke exposure (SHSE) during pregnancy can result in adverse fetal and maternal outcomes, yet an estimated 72.3% of reproductive-aged women in Vietnam experience household SHSE. **METHODS:** The goal of this project was to assess predictors of prenatal household SHSE among 120 women from a northern province in Vietnam who gave birth in the previous year. In addition to demographic information (age, income, education, number of individuals in the home) and frequency of prenatal SHSE (ranging from 1 [never] to 5 [daily]), women reported on: the extent to which they believed prenatal SHSE would harm their child, social support for SHSE avoidance among household members, and how frequently women asked smokers to leave their home to smoke. Multiple linear regression was calculated to predict household SHSE during pregnancy from the variables outlined above. **RESULTS:** Women averaged 28.3 years of age (range 18-39), 64% completed education beyond high school and all were married. Most families had four to six individuals living in their homes (87%). Tobacco smoking inside the home was allowed on special occasions in 55% of homes and 30% of families did not regulate household smoking. Frequency of prenatal household SHSE occurred weekly or more often for 60% of women. While 92% of women wanted and tried to avoid SHSE while pregnant, 45% felt unsupported in their efforts. Higher social support and increased frequency with which women asked smokers to leave the home to smoke significantly predicted decreased household SHSE ($F[7,107]=4.71$, $p<.001$; $R^2=.24$). Perceived harm to the infant did not significantly predict exposure. **CONCLUSION:** Prenatal household SHSE is common among Vietnamese families and while most women are motivated to avoid SHSE, many do not feel supported in their efforts. Although women perceive great harm in child SHSE, these concerns do not correspond to decreased exposure. Interventions that target social support and social negotiation skills may reduce household SHSE among pregnant Vietnamese women.

FUNDING: Federal

PH-94

PERSONALIZED GENETIC RISK TOOL TO PROMOTE SMOKING CESSATION TREATMENT

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Significance: Genetic variation in nicotinic receptor subunits explains differences in smoking behaviors and risk of smoking-related diseases. Personalized genetic risk results specific to smoking may motivate engagement in smoking cessation treatment, yet this is largely untested. We examined the acceptability and potential behavior change associated with a personalized genetic risk communication tool (called 'RiskProfile') among current smokers. **Methods:** Current smokers (n=108) were enrolled in a single arm trial with three visits. At Visit 1, participants completed a baseline assessment and genetic testing via 23andMe. Participants' raw genetic data (*CHRNA5* variants) and smoking heaviness were used to create a tailored *RiskProfile* tool that communicated personalized risks of smoking-related diseases and evidence-based recommendations to promote cessation. Participants received their personalized *RiskProfile* at Visit 2, approximately 6 weeks later. Visit 3 involved a telephone-based follow-up assessment 30 days after receiving *RiskProfile*. **Results:** Of enrolled participants, 83% were retained across the three visits. Acceptability of *RiskProfile* was high (M=4.4; SD=0.6 on scale of 1 to 5), and 89% of participants demonstrated accurate recall of key *RiskProfile* messages. Following receipt of *RiskProfile*, 37% of current smokers reported increased desire to use smoking cessation medications, and 21% reportedly began using cessation pharmacotherapy (i.e., prescription medications or over-the-counter aids such as nicotine patch or gum). Additionally, cigarettes smoked per day decreased from receipt of *RiskProfile* to 30-day follow-up [11.3 vs. 9.8, difference=1.5, 95% CI (0.6–2.4), $p=.001$]. **Conclusion:** A personalized genetic risk communication tool was found to be highly acceptable and associated with increased treatment use and reduced smoking. As the science of genetic biomarkers for smoking continues to develop, we must also develop the tools to communicate this science to individuals who stand to benefit from this information. This study reflects an innovative application of genomic data to personalize and improve evidence-based prevention and treatment.

FUNDING: Federal

PH-95

FACTOR ANALYSIS OF THE MODIFIED CIGARETTE EVALUATION QUESTIONNAIRE AMONG YOUNG ADULT EVER SMOKERS

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Background: The modified Cigarette Evaluation Questionnaire (mCEQ) is a survey instrument developed and validated to evaluate reinforcing effects of cigarette smoking among adults aged >=18 years enrolled in smoking cessation programs. Prior analyses have revealed a 5-factor structure that includes three multiple item factors and two single item factors: psychological reward, satisfaction, "throat hit" (e.g., sensations in the mouth and throat), craving reduction, and aversion. The aim of this study was to validate the mCEQ among a population of current smokers aged 18-24 years not enrolled in smoking cessation programs. **Methods:** Data were collected online through Amazon Mechanical Turk from December 2018 and January 2019. The mCEQ was administered to past year cigarette smokers. A Principal Components Analysis (PCA) was conducted to examine the factor structure of the mCEQ. The analytic sample consisted of n = 2,204 young adult ever smokers who completed the survey in 120 seconds or longer (to account for respondent inattention). **Results:** The mean age of the sample was 21.32 years (SD = 1.97); almost half (43%) were female, and the majority were White (74%). The initial PCA analysis revealed a 2-factor structure with eigenvalues of 7.03 for factor 1 and 1.67 for factor 2, accounting for 72.44% of the variation in the model. After applying Varimax rotation, no changes in factor structure were revealed; however, the strength of the factor loadings increased. Ten items representing reinforcing effects of smoking cigarettes loaded onto factor 1 with loading values ranging from .748 to .879, and two items representing aversion effects loading onto factor 2 with loading values of .902 and .917. **Conclusions:** Unlike the previous analysis, we found a 2-factor structure rather than a 5-factor structure. These findings may differ due to differences in the population age and smoking status. Perceptions of smoking reinforcement and aversion may differ in older adults with more established smoking habits. The mCEQ should be examined further among diverse populations of smokers, as the underlying dimensions of appeal and reinforcement may vary across sub-groups.

FUNDING: Federal



PH-96

RELIABILITY AND VALIDITY OF SELF-REPORT SCALES ASSESSING THIRDDHAND SMOKE KNOWLEDGE, ATTITUDES, AND BEHAVIORS

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SIGNIFICANCE: Previous studies have established the reliability and validity of scales to measure secondhand smoke-related knowledge, attitudes, and behaviors; such scales have been used widely in tobacco prevention research and evaluation. In contrast, the reliability and validity of scales to measure tobacco prevention constructs related to thirdhand smoke, the toxic tobacco residue that remains after smoking has stopped, have not been established. The present study tested the reliability and validity of self-report scales to assess THS-related latent constructs of knowledge, attitudes, and behavior. **METHOD:** These scales were adapted from established secondhand smoke measures and reviewed by tobacco prevention scholars to support face validity. To further explore their psychometric properties, the scales were used in a longitudinal evaluation of a THS awareness campaign. Participants were California adult nonsmokers of low to middle socio-economic status with an interest in children, travel, pets, cars, apartments, or real estate, recruited from Facebook. For seven months, all three scales were completed monthly via Qualtrics. **RESULTS:** Psychometric properties were evaluated at the first ($n=1086$), third ($n=315$), and seventh ($n=301$) month. Analyses found all three scales to demonstrate consistent reliability and single-factor loading at all three timepoints: knowledge (8 items; α range: .87-.90; variability range: 52-61%); attitude (7 items; α range: .84-.87; variability range: 52-57%); behavior (5 items; α range: .80-.86; variability range: 56-64%). Exploratory factor analysis was used to explore, and support, the construct validity of all three scales: knowledge (eigenvalue range: 4.37-4.50); attitude (eigenvalue range: 3.62-3.97); behavior (eigenvalue range: 2.80-3.22). Finally, construct validity was supported through significant correlations among the three scales at all three timepoints (r range: .45-.85; all p -values < .001). **CONCLUSION:** Overall, the psychometric analyses indicated strong reliability and validity for all three scales. Tobacco prevention researchers and advocates can now use established measures to assess THS-related knowledge, attitudes, and behaviors.

FUNDING: State

PH-97

TOBACCO AND VAPING DEPENDENCE, DEPRESSION, AND OTHER CORRELATES AMONG SMOKERS IN MEXICO

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Significance: In high income countries, smoking is increasingly concentrated among people with depression. This study aimed to assess the association between depression and smoking and vaping dependence among adult smokers in Mexico, a middle income country that has implemented a range of tobacco control policies. **Methods:** We analyzed cross-sectional data from an online survey of adult smokers recruited from an online marketing research panel ($n=5,066$). Depression was ascertained by self-reported medical diagnosis of depression and experience of depressive symptoms in the past 2 weeks using the patient health questionnaire ≥ 3 (PHQ-2) in participants who said they had been diagnosed with depression. Smoking dependence was ascertained with 10 items from the Wisconsin Inventory of Smoking Dependence Motives (WISDM), with parallel items developed for e-cigarette use. Smoking frequency (5 or more cigarettes/day vs less often), dual use (smoking and vaping vs exclusive smoking), vaping frequency (3 or more days/week vs less often - among vapers), tobacco dependence and vaping dependence were the dependent variables. Regression models estimated the association between these dependent variables and depression (self-reported medical diagnosis and PHQ-2 ≥ 3), adjusting for age, sex, education, and household income. **Results:** 34.8% of participants were dual users and 5.9% were classified with depression. Smokers with depression were more likely to smoke >5 cigarettes/day (Adjusted Odds Ratio [AOR]: 1.48; 95%CI: 1.09-1.99), be dual users (AOR=1.64; 95%CI: 1.26-2.12), and, among dual users, vape more often (AOR=2.32; 95%CI: 1.60-3.34). Depressed smokers also had higher smoking dependence ($\beta=0.49$; 95%CI: 0.39, 0.58) and, among dual users, vaping dependence ($\beta=0.47$; 95%CI: 0.29, 0.64) compared to smokers without depression. **Conclusions:** Our results indicated a consistent association between

depression and smoking frequency, dependence, dual use, vaping frequency, and vaping dependence. This population may require targeted efforts to promote cessation of all nicotine products.

FUNDING: Federal

PH-98

YOUNG ADULT NICOTINE USERS' ATTITUDES AND RESPONSE TO EVALI

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Significance: In the summer of 2019, an epidemic of what would later be referred to as e-cigarette, or vaping, product use-associated lung injury (EVALI) began. As of February 2020, a total of 2,807 hospitalized cases or deaths and 68 deaths have been reported. The purpose of this study is to assess the response of nicotine-using young adults to the EVALI outbreak. **Methods:** In October and November of 2019, 52 college-going young adults (18-29 years old) who use nicotine products were recruited from two four-year universities in Southern California to participate in focus group discussions on campus smoking policies. Topics also included attitudes toward and response to the EVALI outbreak. After focus group recordings were transcribed, a phenomenological analysis was conducted after structured coding and subcoding of focus group data. **Results:** The average age of respondents was 21.5 years of age, 61.5% ($N=32$) of whom were male. Half were polytobacco users (cigarettes, e-cigarettes, and alternative tobacco products), with 27% e-cigarette only users, 13.5% dual e-cigarette and alternative tobacco product users, and 9.5% cigarette only users. Knowledge of EVALI originated from many sources, but mainly included the news, social media, and friends and family. Respondents commonly associated EVALI with vaping THC and products from irreputable sources. Only a minority of respondents expressed concern over the outbreak, and some reported reducing use, switching to other tobacco products, or quitting. Most respondents, however, disregarded safety warnings for reasons including being light users, not having experienced prior symptoms, use of reputable products, or not vaping THC, and did not change their vaping behavior. **Conclusions:** News of EVALI was widely available to respondents. Limited information on the causes or risk factors associated with EVALI led young adult nicotine users to develop their understanding of the outbreak from their own and others' experiences. A stronger evidence base on the short- and long-term harms associated with vaping is needed, as are well-developed and widespread communication campaigns.

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PH-99

THIRDDHAND SMOKE KNOWLEDGE IN MULTIUNIT HOUSING

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Introduction: While tobacco use is restricted in public spaces, non-smokers' exposure to environmental tobacco smoke (ETS) can happen in the home, especially in multiunit housing (MUH). This study examined committed adult smokers' knowledge of what happens to smoke inside of MUH and how exposure to thirdhand smoke (THS) information affects their intentions to relocate their smoking outdoors. **Methods:** U.S. adults were recruited from Craigslist and screened for tobacco use while inside MUH. Participants ($n=30$) completed online interviews during Spring 2018. Participants were asked about tobacco product use inside MUH, MUH smoking policy, and beliefs about tobacco spread and residue inside MUH. Participants were given information from the Mayo Clinic about THS and its effect on their indoor tobacco use. Qualitative data was coded independently by two coders using NVivo (ICR=98.0%) and analyzed for themes. **Results:** Most participants (mean age 38 years, 60.0% female, and 46.7% white) smoked 11-20 cigarettes per day (53.3%). 56.7% lived in MUH without an indoor smoking policy and 70.0% had no prior knowledge about THS. Despite living with non-smoking policies, smokers would still smoke in MUH. Most assumed no tobacco smells meant no risk of exposure for others. When given information about THS, half stated no intention to stop smoking, 7 still would smoke but clean indoors more, and half intended to relocate their tobacco use outdoors. Those with non-smoking friends and family were more willing to relocate smoking but those surrounded by only smokers were more motivated to relocate to protect belongings. Almost all understood that tobacco residue settled on surfaces but assumed it harmless like dirt or grime rather than a substance that can leach toxins into the air. **Conclusions:** Many MUH smokers do not fully understand or consider how their tobacco use travels inside MUH. Non-smoking MUH policies may



not be effective for this population when not enforced. For smokers who may not be motivated to protect non-smokers, focus on property damage associated with THS could be beneficial. **Keywords:** Thirdhand Smoke, Multiunit Housing, Qualitative Research

FUNDING: Academic Institution

PH-100

PARENT ALCOHOL USE AND YOUNG ADOLESCENT INTENTION TO USE TOBACCO IN INDIA, GENDER DIFFERENCES AND ASSOCIATIONS WITH PARENT MENTAL HEALTH

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Background. Within individuals, use of one psychoactive substance (e.g., alcohol) predisposes use of other psychoactive substances (e.g., tobacco) and parent use of tobacco predisposes child use of tobacco. We examine whether parent alcohol use is associated with adolescent child intention to use tobacco in India and how parent mental health affects this association. **Methods.** We used cross-sectional data from a population-based sample of 1,982 young adolescents (aged 12-14 years) and their parents living in Mumbai and Kolkata, India. The obtained information included demographics, adolescent child intention to use tobacco, parent depressive symptoms and parent past year alcohol use (self- and proxy-reports). **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. **Mental health covariate:** During the past 7 days, how often did you (the parent) feel depressed? Answer options were: Rarely/never, Sometimes, Occasionally, Most of the time. After dichotomizing outcome measures, analyses consisted of logistic regressions, including adolescent age, gender, highest parent education and depressive symptoms as covariates. **Results.** Any past year alcohol use was reported by 19.2% of male and 1.4% of female parents. Female parent alcohol use prevalence was too low to include in analyses. Male parent alcohol use prevalence was associated with adolescent child intention to smoke combustible tobacco products ($p < .001$) and use smokeless tobacco ($p = .02$). Male parent depressive symptoms were also associated with adolescent intention to use smoking and smokeless tobacco (both $p < .05$) but depressive symptoms did not moderate the association between male parent alcohol use and adolescent child intention to use tobacco ($p = .40$). **Conclusions.** In India, male parent alcohol use is associated with adolescent child intention to use tobacco in any form. Depressive symptoms did not moderate this association. Further research into family-based alcohol and tobacco use prevention education is warranted to reduce adolescent intention to use tobacco in the next year.

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

PH-101

COMPARISON OF FIVE ONLINE RESPONDENT PANELS FOR RECRUITMENT OF YOUNG ADULT VAPERS

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Background Online surveys are a valuable tool for researchers, allowing for rapid data collection. While there are dozens of online respondent panels (e.g., Amazon Mechanical Turk [MTurk], Prolific), it is unclear which panel is best for research on young adults who vape. **Methods** Five online respondent panels were selected for comparison across three platforms: 1) Amazon MTurk, Self-Managed, 2) Amazon MTurk, MTurk Toolkit, 3) Amazon MTurk, Managed Research, 4) Prime Panels, Managed Research, and 5) Prolific, Self-Managed. Young adults aged 18-30 years old who reported vaping in the past 30 days on a screening survey were recruited on each platform (total $n = 750$; $n = 146-156$ for each panel). An identical survey was administered across all five samples. **Results** Prevalence of past 30-day vaping on the main survey ranged from 81-82% (Prolific, MTurk Managed Research) to 92% (Prime Panels Managed Research, MTurk Self-Managed) across panels, despite attempts to recruit only past 30-day users. Participant demographics were comparable across panels, with samples skewed mainly toward higher educated, non-Hispanic White individuals. Investigator cost of survey administration varied from \$4/participant (Prolific) to \$8.75/participant (both Managed Research studies) inclusive of a \$3/participant fee, with the more expensive panels generally requiring lower levels of researcher effort to collect data. Time to complete

data collection ranged from 72 hours (Prolific, both Managed Research Studies) to 3 weeks (MTurk Toolkit and Self-Managed). Indices of high data quality (e.g., low failure rate for attention checks) varied considerably, from a high of 84-86% passing all attention checks (Prolific, MTurk Toolkit) to 59% (Prime Panels Managed Research). **Conclusions** Each panel had unique strengths and limitations. In the present study, Prolific emerged as the most cost-effective option with greater indices of high data quality; however, Prolific's screening system was less precise in capturing the target sample. We hope these findings will inform investigators seeking to run high-quality research studies of nicotine users via anonymized, online data collection platforms.

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PH-102

FACTORS ASSOCIATED WITH TRANSITIONS IN TOBACCO PRODUCT USE AMONG DUAL USERS AND EXCLUSIVE SMOKERS: FINDINGS FROM MEXICO, WHERE E-CIGARETTES ARE BANNED.

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Significance: This study examined short-term transitions in tobacco products use among dual users and exclusive smokers in Mexico, where e-cigarettes are banned but increasingly used. **Methods:** Data come from an open cohort of Mexican adult smokers and vapers recruited from an online market research panel and surveyed every 4 months. Data included participants followed for at least one additional wave after recruitment. Frequency and intensity of cigarette and e-cigarette use, perceptions of use amongst family and friends, and ad exposures were reported. Analyses were stratified based on whether a participant was a dual user ($n = 872$) or exclusive smoker ($n = 1,601$) at time (t). Multinomial logistic regression models using time (t) covariates predicted transitions at time (t+1). Among dual users: a) no change=reference, b) transition to exclusive smoker; c) transition to exclusive e-cigarette user or quit. For exclusive smokers at time (t): a) no change=reference, b) transition to dual or exclusive e-cigarettes use; c) Transition to quit. **Results:** Most dual users (76.3%) remained as dual users, 19.6% transitioned to exclusive smoking, and 4.2% to exclusive e-cigarette user or quitter (4.2%). Most exclusive smokers (81%) remained as such, 15.6% transitioned to exclusive e-cigarettes users or dual, and 3.1% had quit at follow-up. Among dual users, factors associated with transition to exclusive smokers included plan to quit (AOR 1.6, 95% CI 1.02, 2.4) and older age (50 years or more) (AOR 2.6, 95% CI 1.4, 2.5). Having a partner, family and friends who smoke, higher education and smoke 5 cigarettes and more per day had lower probability of this transition. Exclusive smokers were more likely to transition to be dual or exclusive e-cigarettes users if they had a higher education, recently tried to quit (AOR 1.7, 95% CI 1.2, 2.3) or if they had friends who used e-cigarettes. **Conclusions:** In spite of intentions and plan to quit both dual users and exclusive smokers are transitioning from exclusive smoker to dual user or change from dual user to exclusive smoker. Therefore, persistence of tobacco use instead a transition to quit require a deeper evaluation, assuming that could be part of a longer transition.

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PH-103

HOW BELIEFS ABOUT POTENTIAL MODIFIED RISK TOBACCO PRODUCTS ARE ASSOCIATED WITH THEIR INTENTIONS TO TRY THE PRODUCTS

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Significance. Under US law, tobacco products may be authorized to claim lower exposure to chemicals, or lower risk of health harms. We sought to examine harm perceptions and beliefs about potential modified risk tobacco products (MRTPs). **Methods.** We recruited 864 adult current and former smokers in August 2019. Participants read a paragraph describing the potential for the FDA to authorize MRTPs and a brief description of heat-not-burn tobacco, snus, and e-cigarettes. They answered questions about harm perceptions, use, beliefs, and intentions to use the three products. We used logistic regression to examine the associated between product beliefs and intentions to use the product. **Results.** In open ended responses, the most common belief about snus and heat-not-burn tobacco concerned non-lung health risks, for e-cigarettes it was safety concerns associated with using the product. In close-ended responses, the most endorsed beliefs for each product were that they contained nicotine (mean range = 3.80 to 3.98) and that they were risky (mean range = 3.76 to 3.95). Believing



that e-cigarettes can help smokers quit smoking (OR=1.61), that they tasted good (OR=1.56), and looked cool (OR=1.42) were associated with greater odds of intending to try e-cigarettes after controlling for demographic and tobacco use factors. Believing that the science about e-cigarettes was untrustworthy was associated with lower odds of intending to try e-cigarettes (OR=.61). For snus, the beliefs that the product was not addictive (OR=2.07) and tasted good (OR=1.45) were associated with increased odds of intending to try snus. Believing that the science about snus was untrustworthy (OR=.59) and that the product was risky (OR=.63) was associated with lower odds of intending to try snus. The beliefs that heat-not-burn tobacco would taste good (OR=2.92) and would be a good quit aid (OR=1.72) were associated with increased odds of intentions to try heat-not burn tobacco products. Believing that heat-not-burn was expensive was associated with lower odds of intending to try (OR=.67). **Conclusions.** Knowing what the public believes about products currently or potentially authorized to be marketed as modified risk tobacco products can inform communication efforts about these products. Understanding how these beliefs are associated with intentions to try the product can inform surveillance that ensures the products currently authorized to be marketed as MRTPs are not misleading the public or prompting people who do not currently use tobacco products to initiate use.

FUNDING: Federal

PH-104

ASSOCIATION OF DAY-LEVEL VOLATILITY IN CIGARETTE AND E-CIGARETTE ON 50% SMOKING REDUCTION AMONGST ADULT SMOKERS ENROLLED IN A REDUCTION CHALLENGE TRIAL

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Significance: Volatility in ex-smokers' emotional behaviors (e.g. smoking urges, negative affect) has been shown to negatively impact cigarette reduction and cessation outcomes. However, research has not focused on the volatility of smoking and vaping behaviors among smokers trying to reduce cigarette consumption through the use of e-cigarettes. With the understanding that spikes in cravings are theorized to be associated with relapses in smoking, we evaluated whether deviations from consistent cigarette and e-cigarette usage patterns were associated with successfully reaching a 50% cigarettes per day (CPD) smoking reduction threshold. Understanding the role that volatility in e-cigarette and cigarette use has on smoking outcomes will provide important insights for smoking reduction and cessation guidance. Methods: Eighty-four smokers interested in quitting smoking enrolled in a 2014 RCT pilot study at NYU Langone Hospital received an e-cigarette and reported smoking and e-cigarette use behavior four times daily over the course of 21 days. Using aggregated daily CPD and ECPD, we determined mean absolute deviation (MAD) for each person for both e-cigarette and cigarette use - MAD reflects the average discrepancies between model-predicted values for CPD/ECPD and actual values for each participant. We used the MAD value as a predictor of 50% smoking reduction at week 3. Results: Higher levels of volatility in cigarette-use were associated with lower likelihood of reaching 50% CPD reduction at week 3. Each additional unit increase in CPD volatility from the average was associated with a decrease of nearly 30% in likelihood of reaching the 50% reduction threshold (OR=0.67, 95% CI = 0.49-0.92). For ECPD volatility, higher levels of volatility were associated with small increases in likelihood of reaching the reduction threshold (OR=1.03, 95% CI = 0.80-1.32). Conclusions: Cigarette use patterns characterized by more volatility, even if the daily reductions are small, may result in poorer outcomes for reaching a 50% CPD reduction threshold. For e-cigarette use, higher volatility in use patterns may yield a protective effect for CPD reduction outcomes. As this was a pilot study, further research should validate these findings on larger, powered samples.

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PH-105

HEALTH BELIEFS AND ADAPTIVE BEHAVIORS DESCRIBED IN ONLINE VAPING COMMUNITIES DURING THE EMERGENCE OF E-CIGARETTE/VAPING-ASSOCIATED LUNG INJURY (EVALI)

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In summer 2019, US hospitals reported increased incidence of an emerging acute pulmonary illness occurring in vape device users. The outbreak of the newly identified condition, named e-cigarette/vaping-associated lung injury (EVALI), continued through

the end of 2019. During this time, vape users shared their experiences, risk perceptions, and adaptive behaviors on social media. This study analyzed vape users' EVALI-related discussions on the social media platform Reddit over the course of the outbreak. EVALI-related posts and associated comments were extracted from five subreddits frequented by vape users: r/electronic_cigarette, r/juul, r/vaping, r/quittingJUUL, and r/DIY_eJuice. Posts and all associated comments were included in the analytic dataset if they were posted September 1, 2019 - December 31, 2019 and contained at least one of approximately 30 EVALI-related keywords. The final dataset contained 810 Reddit posts plus associated comments (N=10,386). Of the 810 posts, most were in September (n=562), followed by October (n=103), November (n=76), and December (n=69). Three coders conducted inductive qualitative analysis to identify emergent themes using ATLAS.ti. Codes were grouped under the following concepts: vape product design and ingredients; vape product terminology; perceived harm; health impacts; and perceptions of EVALI information sources. Main themes included vape users': (a) expressions of worry or seeking reassurance about the risks posed by EVALI; (b) reporting of potential EVALI-related symptoms (e.g., chest pain) and seeking health advice from fellow users; (c) rationalizations about continued vape use (e.g., distinguishing own product from perceived source of harm) and (d) discussing changes in vaping behaviors to mitigate risk of EVALI (e.g., lowering the amount of nicotine vaped, switching product type or brand, quitting vaping). Subreddits systematically varied in type and amount of social pressure or social support provided by commenters in response to original posts. Findings can inform the development of risk communication and public health surveillance measures of vaping behaviors during outbreaks of vaping-associated lung injuries.

FUNDING: Other

PH-106

EXPOSURE TO TOBACCO ADVERTISING ON SOCIAL MEDIA AND SMOKELESS TOBACCO USE AMONG YOUTH AND YOUNG ADULTS

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Significance: Smokeless tobacco (ST) use among youth has increased since 2010 and is currently used by 6% of US high-schoolers. Youth are highly accessible via social media, an environment where tobacco companies employ targeted marketing tactics. Tobacco advertising exposure can lead to tobacco use initiation. This study aims to estimate the effect of self-reported exposure to social media messages promoting tobacco products on ST use among youth and young adults aged 15-34. Methods: This analysis includes participants with data across Wave 7-9 (Feb-May 2018, Feb-May 2019, Sep-Dec 2019) of the Truth Longitudinal Cohort, a national probability-based sample (N=20,559). Merged state-level data include the real average price per ounce of ST, presence of comprehensive smoke-free indoor air policy (including workplaces, restaurants and bars), and real per capita tobacco control expenditures for the appropriate wave-year. A logistic regression modeled the effect of social media tobacco advertising exposure on ST prevalence. The model controlled for average daily social media use, race/ethnicity, age, gender, metropolitan status, household income, parental education, household tobacco use, peer smoking, sensation seeking tendencies, and state-level data. In addition, to control for unobserved state and wave level heterogeneity, we included state and wave fixed effects. Results: Exposure to tobacco advertising on social media increased the odds of being a current ST user [aOR: 3.46, p-value: < 0.001]. Additionally, participants who are male, white, older, reside in non-metropolitan areas, have more peers that smoke, are exposed to household tobacco use, use social media at higher rates, and have higher sensation seeking tendencies had significantly greater odds of current ST use. Conclusion: Tobacco advertising exposure on social media is associated with greater odds of ST use in youth and young adults. Study findings underscore the critical need for increased advertising regulation on social media and surveillance of digital marketing tactics targeted at this vulnerable population.

FUNDING: Federal



PH-107

CHANGES IN YOUNG ADULT SUBSTANCE USE DURING COVID-19 AS A FUNCTION OF ACES, DEPRESSION, PRIOR SUBSTANCE USE AND RESILIENCE

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Significance: Pandemics may lead to increased societal stress, which frequently coincides with increased substance use. Research is emerging regarding risk and/or protective factors for increasing substance use during COVID-19. The current study examined 1) pre-pandemic substance use, depression, and adverse childhood experiences (ACEs) as risk factors for changes in cigarette, e-cigarette, marijuana, and alcohol use during COVID-19 and 2) resilience as a moderator of these associations. **Methods:** We analyzed data from 1,084 participants (ages 18-34) in a two-year, five-wave longitudinal study, specifically from Wave 3 (W3; Sept-Dec 2019) and Wave 4 (W4; March-May 2020). Depressive symptoms, ACEs, and resilience were assessed at W3; past 30-day use of cigarettes, e-cigarettes, marijuana, and alcohol were assessed at W3 and W4 (and used to calculate change scores among individuals who used each substance at W3 or W4). **Results:** In this sample ($M_{age}=24.76$, $SD=4.70$; 51.8% female; 73.6% White; 4.0% Black, 12.2% Asian; 12.5% Hispanic), multivariate regressions indicated that greater increases in e-cigarette use were predicted by greater ACEs for all participants and greater W3 depression and e-cigarette use for individuals with lower resilience. Greater decreases in cigarette use were predicted by greater W3 e-cigarette and cigarette use for individuals with higher resilience. Greater decreases in marijuana use were predicted by greater W3 marijuana use for all individuals; greater increases in marijuana use were predicted by greater ACEs and W3 alcohol use for individuals with lower resilience. Greater decreases in alcohol use were predicted by greater W3 alcohol use for all individuals; greater increases in alcohol use were associated with greater depression for individuals with lower resilience. **Conclusion:** Findings highlight the protective role of resilience on increased e-cigarette, marijuana, and alcohol use during COVID-19, particularly in relation to ACEs, depression, and pre-pandemic substance use. Findings can inform intervention efforts tailored to reducing substance use among individuals at risk for increasing substance use in response to societal stress.

FUNDING: Federal

PH-108

ELECTRONIC NICOTINE PRODUCT DISCONTINUATION AND CIGARETTE SMOKING: ANALYSIS OF WAVES 3 AND 4 FROM THE PATH STUDY

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Significance: Identifying correlates of electronic nicotine product (ENP) discontinuation can inform interventions to address the vaping epidemic. High rates of dual ENP-cigarette use and transitions between these products underscore the importance of considering cigarette smoking status when assessing ENP discontinuation. **Methods:** We examined ENP and cigarette use transitions and their correlates among adult established ENP users from waves 3 (W3) to 4 (W4) of the PATH study ($N=1,391$). At W3, past 30-day cigarette users were considered current smokers; among past 30-day non-users, former smokers were distinguished from non-smokers based on the greater than/equal to 100 cigarettes smoked in lifetime threshold. W4 status for both products was defined as past 30-day use. We used multinomial logistic regression to estimate relative risk ratios (RRR) of using neither product or cigarettes only compared to using ENPs only or both products at W4 as a function of W3 sociodemographic, tobacco and substance use, ENP use and psychosocial correlates. **Results:** A majority of the sample was aged 25-44 years (41%), 53% were male, 71% were non-Hispanic White and 67% were current smokers. At W4, 41% discontinued ENPs: 30% used cigarettes only and only 11% used neither product. W3 non-smokers were more like to use neither product at W4 and W3 current smokers were more likely to use cigarettes only at W4 (chi-square=573.03, $p<0.0001$). Current smokers, daily ENP users and those living in a household allowing some use of ENPs or receiving advice to quit ENPs were less likely to use neither product vs both products ($p<0.05$). Males and non-Hispanic Whites were less likely to use neither product vs ENPs only ($p<0.05$). Current smokers were more likely to discontinue ENPs and use cigarettes only, while daily ENP users were less likely to discontinue using ENPs ($p<0.05$). **Conclusions:** The majority of those discontinuing ENPs switched to using cigarettes only. Vaping cessation interventions could target males, non-Hispanic Whites and daily ENP users. Additionally, dual ENP-cigarette users may require intensive interventions that address use of both products.

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PH-109

ENDS USE AMONG TRANSGENDER INDIVIDUALS: FINDINGS FROM WAVE 4 PATH DATA

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Significance: Limited information exists about electronic nicotine delivery system (ENDS) use prevalence and related behaviors among transgender (trans) individuals. Only one study exists, which reports current ENDS use as over five times higher among trans individuals than their cisgender (cis) counterparts. The present goal is to add to the limited information that exists about trans individuals' ENDS use behaviors. **Methods:** Data from adults (aged 18+) included in Wave 4 (collection year 2016-2018) of the Population Assessment of Tobacco and Health (PATH) Study ($N=33,628$, 225 trans vs 33,403 cis) were analyzed, including items assessing demographics, ENDS use prevalence, dependence, reasons for reported ENDS use, and mental health experiences related to ENDS quit attempts. Design-based adjusted chi square and adjusted Wald mean comparison analyses compared ENDS use behaviors between trans and cis respondents. **Results:** Trans respondents were younger than cis respondents (37.83 vs 47.14 years old, respectively), were less likely to be heterosexual/straight or have a high school diploma or GED, and were more likely to have an income of less than \$10,000 ($ps<.001$). Trans individuals were more likely to have ever used ENDS, used within the past 30 days, and currently use every day or some days ($ps<.001$). Looking at specific ENDS use, trans individuals were more likely to report the use of e-cigarettes, e-pipes, and e-hookahs ($ps<.01$). Trans respondents also reported lower ages of initiation of ENDS use (17.39 vs 27.58, respectively; $p<.001$), and were also more likely to be dependent on ENDS by subjective and objective measures, and reported a higher number of negative mental health effects when attempting to cut back or quit use ($ps<.05$). Although there was no difference in current interest to quit ENDS use, trans individuals were more likely to report intent to quit one day ($p<.05$). **Conclusions:** The experiences and risk factors for ENDS use among trans individuals appear to be unique. Regulations on ENDS are needed to reduce disparities in ENDS use among this population. The current findings suggest a need to target this group for ENDS prevention and cessation and to tailor cessation messaging and programming initiatives to meet the unique needs of trans individuals.

FUNDING: Federal

PH-110

EXAMINING OF THE RELATIONSHIP OF FLAVORED TOBACCO PRODUCT POLICY RESTRICTIONS AND FLAVORED AND ANY TOBACCO PRODUCT USE, AMONG ADOLESCENTS AND YOUNG ADULTS IN THE U.S.

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Significance: Flavored tobacco products (FTPs) are used disproportionately by youth and young adults, and by racial/ethnic minority populations. Local policies restricting retail FTP sale are aimed at reducing access to and ultimately use of these products. This analysis examines whether exposure to a policy restricting FTP sales is associated with FTP and any tobacco product (ATP) use among adolescents and young adults, controlling for individual demographic and psychosocial characteristics associated with tobacco use. **Methods:** Data are from Wave 9 of the Truth Longitudinal Cohort survey fielded September - December of 2019, using a national, address-based, probability-based sampling method ($n=10,902$). State and local policies restricting FTP sale were assessed as of December 31, 2019 and FTP policy coverage was linked to participant home address. Multi-level logistic regression models examined the cross-sectional relationship between FTP policy coverage and FTP use among participants at Wave 9 of the TLC ages 15-36. ATP use in relation to flavor policy coverage was also modeled to understand potential broader impacts of these policies. Individual covariates included age, gender, race/ethnicity, educational attainment, parental education, financial status, mental health status, household tobacco use, peer tobacco use, anti-industry sentiment, sensation seeking tendency and current marijuana use. **Results:** There were $n=1105$ participants (9.6%) covered by an FTP policy, while 14.9% of participants were FTP users ($n=1,757$) and 21.8% of participants were ATP users ($n=2,453$). In multivariable analyses, FTP ($aOR=0.60$; CI: 0.41, 0.89) and ATP use ($aOR=0.52$; CI: 0.35, 0.78) was lower among those covered by a flavor policy compared with those without policy coverage. **Conclusion:** In a nationwide sample, FTP policy exposure was found to be a significant correlate of lower odds of FTP and ATP use. While this is promising given



that flavor policies continue to expand in the US, this cross-sectional analysis cannot determine causality of policy related to tobacco use. Further research is needed to understand the longitudinal effect of policy enactment on changes in use patterns.

FUNDING: Other

PH-111

THE IMPORTANCE OF E-CIGARETTE DEVICE AND E-LIQUID PRODUCT CHARACTERISTICS AMONG YOUNG ADULTS WHO VAPE

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Introduction: Extant research has identified several e-cigarette attributes that are thought to be important to young adults who vape. Understanding what attributes are most important and how the importance of these attributes differ across disparate populations (i.e., by age, or for non-smokers vs. smokers) can inform targeted regulation to reduce the adverse public health impact of e-cigarettes. **Methods:** Data were collected from young adults (aged 18-30 years; n=298) online via *Prolific* from September-October 2019. Participants rated the importance of ten e-cigarette (i.e., price, type, brand, size, color, device popularity, customizability, temperature/voltage, strength of hit, and compatibility with preferred nicotine formulation) and nine e-liquid (i.e., price, brand, flavor, name, nicotine level, nicotine formulation, bottle top, packaging design) characteristics on a visual analogue scale (range 0-100). Multivariable linear regression models examined differences in ratings of importance by sociodemographic characteristics and cigarette smoking status. **Results:** Price (M=81.1), size (M=75.5), and hit (M=73.8) were the most important e-cigarette device attributes in the sample overall, while flavor (M=85.1), price (M=80.9), and nicotine level (M=77.7) were the top-rated e-liquid attributes. Those with low (vs. high) income rated e-liquid price (p=0.01) and device price (p=0.005) as more important. Older vapers (26-30 years; vs. younger vapers [18-21 years]) rated e-liquid flavor as more important (p=0.003). No statistically significant differences in importance scores for any of the top attributes by smoking status or other sociodemographic characteristics were observed. **Discussion:** This study highlights important characteristics of e-cigarette devices and e-liquids among young adults who vape, including price, device size and hit, and e-liquid flavor and nicotine level; such factors may be key targets for regulation. Few differences in the top characteristics were observed among smokers vs. non-smokers, suggesting that policies targeting these attributes may likely discourage both young adults starting to vape and smokers looking to quit.

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PH-112

CORRELATES OF SMOKING CESSATION IN A COHORT STUDY OF MEXICAN SMOKERS AND E-CIGARETTE USERS

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Significance: As dual use of cigarettes and e-cigarettes has emerged as a dominant tobacco product use pattern around the world, it is critical to evaluate transitions toward cessation in this population. This study assessed transition behavior to cessation among dual users and exclusive smokers, including factors associated with this transition. **Methods:** Data were analyzed from an open cohort of exclusive smokers and dual users recruited from an online commercial research panel. Data were analyzed only from participants followed for at least one additional wave after recruitment (n=3,184), carried out during 6 consecutive waves from November 2018 to July 2020. Upon entrée into the study time (t), participants reported the frequency and intensity of e-cigarette use and combustible cigarettes. Four months later time (t+1), the same questions were asked and used to define cessation as not having used cigarettes or e-cigarettes for at least 30 days at the time of the follow-up survey, they also provided information about e-cigarette use for cessation purposes, social norms, smoking and e-cigarette dependence, and ad exposures at baseline. Multiple logistic regression models regressed cessation at t+1 on socio-demographic and tobacco use characteristics at time t. **Results:** Prevalence of cessation of use for e-cigarettes and/or combustible cigarettes for more than 30 days

was 4 % at follow-up. The strongest correlate of subsequent cessation was smoking frequency nondaily (AOR=4.7, 95% CI= 2.9, 7.3) vs. daily smokers. The likelihood to have a cessation behavior for more than 30 days at follow-up was lower among those who smoke more than 5 cigarettes per day (AOR= 0.2, 95% CI= 0.1, 0.3), with a partner who smokes (AOR=0.6, 95% CI=0.4, 0.9) or use e-cigarettes and family and friends who smoke or use e-cigarette (AOR=0.5, 95% CI=0.3, 0.8). **Conclusions:** Smoking frequency and social norms are associated with sustained cessation of more than 30 days in a sample of Mexican adults' users of combustible cigarettes and/or e-cigarette. E-cigarette use was not associated, suggesting that it may not facilitate cessation, even in this population where smoking frequency is relatively low.

FUNDING: Federal

PH-113

ASSOCIATIONS BETWEEN STATE-LEVEL MARIJUANA LAWS AND U.S. ADOLESCENTS' MARIJUANA USE VIA ELECTRONIC NICOTINE DELIVERY SYSTEMS, DIFFERENCES BY SEXUAL IDENTITY

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Significance: Research generally shows that U.S. adolescents living in states that have legalized medical and/or recreational cannabis use marijuana at higher rates than their peers living in states where use remains illegal. However, it remains unclear whether groups who are more vulnerable to substance use (i.e., sexual minorities) and who live in states with legalized marijuana are particularly susceptible to greater use. **Methods:** We used individual survey and state-level data from adolescents aged 14-17 years who were included in the fourth wave (2017-2018) of the Population Assessment of Tobacco and Health Study (n=10,038). We divided states into three groups based on whether recreational marijuana use was legal (RML), only medical marijuana use was legal (MLO), and states that prohibited medical/recreational use (PMU) (based on legalization status during January of 2018). The outcome of interest was whether respondents ever used marijuana in electronic nicotine delivery systems (ENDS). The major independent variable was a dichotomous measure of sexual identity (heterosexual vs. sexual minority [i.e., gay/lesbian, bisexual, or 'something else']). **Results:** One out of eight adolescents (12.1%) indicated using marijuana in ENDS during their lifetime; this varied across legalization status of states (RML, 14.5% [95% CI, 12.6% - 16.7%]; MLO, 12.6% [95% CI, 11.4% - 13.9%]; PMU, 9.6% [95% CI, 8.5% - 10.9%]). Moreover, sexual minorities (20.2%) were more likely to indicate lifetime marijuana use in ENDS when compared to heterosexuals (11.1%). However, sexual minorities had similar rates of lifetime marijuana use in ENDS regardless of legalization status of states. **Conclusions:** While marijuana use in ENDS is more prevalent among all youth in states that have legalized recreational marijuana use, sexual minority adolescents appear to be at greater risk of using marijuana in these devices when compared to their heterosexual peers—regardless of the legalization status across states. Continued effort on prevention to reduce marijuana use among sexual minority youth is needed across all U.S. states. Supported by research grants NIH/NCI R01CA203809, R01CA212517, NIH/NIDA R01DA044157, R01DA043696, R21DA051388.

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PH-114

LATENT CLASS ANALYSIS OF QUITTING PATTERNS AMONG LEBANESE ADOLESCENT WATERPIPE SMOKERS

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Significance: Waterpipe (WP) tobacco smoking has increased globally, mainly among adolescents, putting them at risk of addiction and disease. Most adolescent WP smokers report not wanting to quit, but little is known about whether they do quit and what factors predict quitting. **Methods:** School-based cohort study in Beirut, Lebanon including 138 boys and girls (mean age 14.3 years at baseline) who smoked WP in the past month at baseline and were assessed up to 7 times over 3.5 years. At each follow-up wave, students were classified as quitters (attempted to quit and did not smoke over the past 6 months) or not. Latent Class Growth Modelling (LCGM) was used to identify groups of students with similar quit trajectories over time. Logistic regression estimated



predictors of group membership. Significant predictors from bivariate models ($p < 0.25$) were included in a final multivariable model and included religion, socio-demographics, family/peer WP smoking, attitudes toward WP use (e.g. attractiveness), psychological traits (e.g. depression), nicotine dependence, and interest and confidence in quitting. **Results** Only 7 (5.1%) of students never quit at any follow-up wave. While switching between quitting vs. not quitting was common, 79 (57.2%) of students quit at ≥ 4 of 6 waves. LCGM identified 2 distinct groups. In Group 1 ($n=62$, 44.9%), quitting remained low across all waves, ranging from 28.7% to 45.9%. In Group 2 ($n=76$, 55.1%), likelihood of quitting was high and increased over time from 68.0% to 93.8%. Predictors of quitting (membership in Group 2 vs. 1) were being Muslim (vs. Christian; $OR=3.01$, 95% $CI=1.11-8.19$), greater baseline interest in quitting ($OR=1.89$, 1.14-3.14), lower stress ($OR=0.94$, 0.89-0.99), and lower belief that WP smoking makes them feel sociable ($OR=0.42$, 0.23-0.78) and WP smokers have more friends ($OR=0.31$, 0.13-0.73). **Conclusion** Most Lebanese adolescents quit WP over 3.5 years, but many did not maintain abstinence. Muslims and those who reported less stress and social utility of WP smoking were more likely to quit.

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PH-115

TRAJECTORIES OF WATERPIPE USE ESCALATION AMONG LEBANESE ADOLESCENTS

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Significance Significant variation exists in use trajectories among adult waterpipe (WP; "hookah") users. Variations in use trajectories and predictors of these trajectories have not been studied in adolescents, a group with higher prevalence of WP use than adults. **Methods** School-based cohort study in Beirut, Lebanon including 138 boys and girls (mean age 14.3 years at baseline) who smoked WP in the past month and were assessed up to 7 times over 3.5 years. Latent Class Growth Modelling (LCGM) identified students with distinct trajectories in number of WPs smoked per month. Logistic regression was used to estimate predictors of trajectory membership compared to never-smokers ($n=73$). Baseline predictors included sociodemographics, family/peer smoking, attitudes toward WP use (e.g., attractiveness), nicotine dependence, and psychological traits (depression, stress, novelty-seeking, distractibility, impulsivity, self-esteem). Odds ratios (OR) and 95% confidence intervals were reported from the final multivariable model. **Results** LCGM identified three trajectories: (1) "Low and decreasing" ($n=69$); (2) "Low and increasing" ($n=62$); and (3) "High and steady" ($n=7$). From Waves 1-7, Group 1 significantly decreased from 6.6 to 1.7 WPs/month, Group 2 increased from 7.9 to 20.0, and Group 3 increased but non-significantly from 27.3 to 68.6. Compared to never-smokers, Groups 2 and 3 reported more stress ($OR=1.09$, 95% $CI=1.02-1.18$, and 1.16, 1.04-1.29, respectively); Group 2 was less likely to have mothers who graduated high school ($OR=0.34$, 0.15-0.78), and Groups 1 and 2 were more likely at baseline to plan to smoke in the next year ($OR=11.55$, 2.84-47.05 and $OR=36.23$, 4.04-325.94, respectively) and more likely to agree that WP smokers look more attractive ($OR=4.35$, 1.75-10.80 and $OR=3.74$, 1.42-9.82, respectively). Group 3 reported higher dependence than Group 1 ($OR=1.29$, 1.07-1.57) and Group 2 ($OR=1.26$, 1.04-1.52). **Conclusions** Adolescents exhibited distinct WP use trajectories with 50% more than doubling the number of WPs smoked per month over 3.5 years and a small group with sustained high use. Adolescents with stress, positive attitudes toward WP, higher dependence, and mothers with lower education should be targeted to prevent WP use escalation.

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PH-116

EFFICIENT ADMINISTRATION OF REMOTE OUTCOME ASSESSMENTS: TELEPHONE AND EMAIL METRICS VIA QUITPRO EVAL

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Significance: Timely and efficient outcome assessments are critical to the success of tobacco research and intervention projects. The onset of COVID19 made imperative

the need to plan for, conduct, and track the efficient remote administration of outcomes assessments. Assessments by telephone and email are strategies accessible to most projects and can be streamlined with customized software. This study examined the metrics of contacting participants from multiple tobacco treatment programs by telephone and email for outcome assessments using a custom data management software called QuitPro Eval. **Methods:** QuitPro Eval managed the administration of outcome assessments for multiple projects simultaneously. Links to outcome assessment questionnaires were sent by email to all prospects with email addresses followed by up to 5 emailed reminders. Prospects were also automatically assigned to interviewers as they entered the calling queue. Metrics extracted from QuitPro Eval were examined from May 1 to July 31, 2020. **Results:** Among emails successfully delivered, ($n=5,260$), 11.7% ($n=617$) resulted in completed assessments. Among the telephone contact attempts ($n=5,786$), voicemail messages were left on 49.4% ($n=2,856$) of attempts; 17.1% ($n=991$) resulted in requests to re-contact at a different time; 12.8% ($n=742$) in no answer; 11.2% ($n=649$) in completed assessments; 3.8% ($n=222$) in refusals; and 5.6% ($n=326$) in other dispositions. The mean duration of an attempt was 2.3 minutes (range 0.1-32.7). The mean duration of a completion was 7.9 minutes (range 2.4-32.7). Across interviewers, the mean number of calls per hour was of 23.5 (range 13.3-34.5). **Conclusions:** Planning and implementation of remote administration of outcome assessments are critical to adapting to a research and intervention environment during the COVID19 pandemic. These findings can help identify efficiencies and which are important for the timely and efficient assessment of outcomes.

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PH-117

ADOLESCENT DAILY USE OF FLAVORED E-CIGARETTES AND ASSOCIATIONS WITH USE OCCASIONS, NUMBER OF PUFFS, AND NEXT DAY INTENTIONS AND WILLINGNESS

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Significance. In February 2020, the FDA issued a policy restricting the sale of flavored, cartridge-based electronic nicotine delivery systems (ENDS) products. The policy excluded menthol- and tobacco-flavored products, yet little is known about the contribution of these flavors to e-cigarette use among adolescents. Further, public health experts are concerned that youth will continue to use fruit- and candy-flavored ENDS products by switching to tank systems or disposables, or by obtaining illegally manufactured flavored products. Additional evidence is needed to understand the contribution of specific flavors, including tobacco and menthol, to adolescent ENDS use in order to further inform FDA regulations. **Methods.** Using data from an ecological momentary assessment study conducted in 2018, we investigated the effects of specific flavors on same day e-cigarette use and next day intentions and willingness to vape and smoke. We examined associations among 50 vapers (ages 14-17) over 14 days, using mixed effects random intercept regressions. Data were aggregated to reflect daily use. On average, data were available for 13.4 days per participant ($N=670$ observations). **Results.** Youth vaped nicotine with at least one flavor on 87% of occasions (fruit = 55%; mint = 30%; tobacco = 6%; menthol = 5%, and candy, sweets, or chocolate = 5%). Controlling for covariates (sex, age, spending money, and time/growth contrasts), results showed that vaping tobacco flavor significantly predicted more e-cigarette use occasions per day ($r=.20$, $p < .01$) and total puffs per day ($r=.15$, $p < .05$). Vaping fruit flavors significantly predicted more total puffs per day ($r=.13$, $p < .05$). Vaping because "it comes in flavors I like" predicted more e-cigarette use occasions per day ($r=.19$, $p < .001$), total puffs per day ($r=.24$, $p < .001$), and e-cigarette use intentions ($OR=5.63$, $p < .05$) and willingness ($r=.23$, $p < .001$). Vaping menthol flavor was negatively associated with greater willingness to use e-cigarettes ($r=-.14$, $p < .05$). **Conclusion.** Results provide support for further development of policies restricting the marketing and sale of flavored e-cigarette products to adolescents, including tobacco flavors.

FUNDING: Federal



PH-118

EFFECTS OF E-CIGARETTE USE ON AGE OF REGULAR CIGARETTE SMOKING ONSET ACROSS RACE/ETHNIC GROUPS

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Significance: Cigarette smoking is generally initiated during adolescence, and a younger age of regular cigarette use compounds risks for adverse health consequences. Due to increasing e-cigarette use among adolescents, concerns related to its effects on the age of regular cigarette smoking warrant further investigation. We examined the effects of e-cigarette use on the age at which race/ethnic groups in the United States reported starting to smoke cigarettes fairly regularly. **Methods:** We analyzed the 2014/15 & 2018/19 Tobacco Use Supplements to the Current Population Surveys to examine the impact of ever e-cigarette use on the mean age at which ever smokers reported starting to smoke cigarettes fairly regularly, across race/ethnic groups (American Indians/Alaskan Natives, Asians, Hispanics/Latinos, non-Hispanic Blacks, and non-Hispanic Whites). **Results:** Ever e-cigarette users across all race/ethnic groups except non-Hispanic Blacks and Asians began smoking cigarettes fairly regularly significantly younger than never e-cigarette users. American Indian/Alaska Native ever e-cigarette users began smoking cigarettes regularly two years younger (16.5±0.6yrs) than never users (18.5±0.5yrs), one year younger for Hispanic/Latino ever e-cigarette users (17.7±0.2yrs) than never users (18.7±0.3yrs), and 0.6 years younger for non-Hispanic White ever e-cigarette users (17.3±0.1yrs) than never users (17.9±0.1yrs). Non-Hispanic Black and Asian ever (19.0±0.3yrs & 20.6±0.8yrs, respectively) and never (18.9±0.2yrs & 20.6±0.4yrs, respectively) e-cigarette users began smoking cigarettes regularly at older ages than other race/ethnic groups. **Conclusion:** Among American Indians/Alaska Natives, Hispanics/Latinos and non-Hispanic Whites, e-cigarette use is associated with a significantly younger age of regular cigarette smoking onset. Despite older ages of regular cigarette smoking onset, no such effect was observed for non-Hispanic Blacks and Asians, indicating racial/ethnic disparities on how e-cigarettes affect age of regular cigarette smoking. Prevention and regulatory efforts can be improved by considering how e-cigarettes may encourage younger age of regular cigarette use. **Research supported by the National Institutes of Health award numbers U54CA132384 & U54CA132379 and grant number 28IR-0066 from the California Tobacco-Related Disease Research Program.**

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PH-119

PERCEPTIONS OF SMOKING STATUS IN SIMULATED HIRING DECISIONS

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Background: Jobseekers who smoke have a harder time securing re-employment than nonsmokers. We examined perceptions of smoking status in hiring decisions for different jobs and tested respondents' smoking history as a moderator. **Methods:** Employed adults ($N=1120$, 52% male, age $M=38.2\pm 11.7$) were recruited from Prolific survey panels in 2019; 60% had smoked 100+ cigarettes in their lifetime; 63% made hiring decisions at work. On a 4-point scale, respondents indicated whether they would hire a receptionist, groundskeeper, and health aide who smelled of cigarette smoke (dichotomized as would/definitely vs. might/never); parallel items asked about an overweight candidate. For hiring a sales associate, storeroom clerk, and cook, respondents rank ordered their 3 most and least preferred attributes from: smells of cigarette smoke, highly recommended, has noticeable body odor, is physically attractive, is physically unattractive, has a strong foreign accent, is 50 pounds overweight, and has visible tattoos. **Results:** The percent willing to hire someone smelling of cigarette smoke was 8% for health aide, 16% for receptionist, and 54% for groundskeeper. Overall, "smells of cigarette smoke" was second only to body odor as the least preferred attribute and was a top 3 least-preferred attribute for 70% in hiring a sales associate, 75% for a clerk, and 81% a cook. Ratings did not differ by whether respondents made hiring decisions at their work. Never smokers were significantly less likely than ever smokers to indicate they would hire a receptionist ($OR=0.32$), groundskeeper ($OR=0.49$), and health aide ($OR=0.46$) who smelled of smoke ($ps<.001$), and were significantly more likely than ever smokers to rank a smoker in their bottom 3 choices for each role ($ps<.009$). Never and ever smokers did not significantly differ in hiring and attribute rankings for overweight candidates ($ps>.103$). **Conclusions:** In hypothetical hiring decisions for varied occupational roles, never smokers were significantly less likely to hire a candidate who smelled like cigarette smoke than were ever-smokers. Results were consistent across job positions and specific to smoking (vs. overweight).

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PH-120

SMOKING CHARACTERISTICS AMONG SEXUAL AND GENDER MINORITIES IN 30 U.S. CITIES

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Significance: Sexual and gender minority (SGM) individuals are at greater risk for smoking. Less is known about differences in nicotine and tobacco use between SGM and non-SGM adults who smoke, and how such differences may vary geographically. We examined cigarettes per day, cigarette dependence, quit attempts, and past-month vaping as a function of SGM population among residents of 30 U.S. cities. **Methods:** Adult daily smokers ($N=2,606$, age $M=38.6$ years [$SD=10.1$]; 13.2% SGM) were recruited from 30 U.S. cities that are part of the Advancing Science & Practice in the Retail Environment (ASPIRE) multi-institutional consortium. Participants reported cigarettes per day (1-60+), time to first cigarette (within/after 30 minutes of waking), making a 7-day quit attempt in the past 6 months (yes/no), and past-month e-cigarette vaping (yes/no). At the city level, the proportion of SGM residents was measured in a 2012-2014 Gallup U.S. Daily Poll. Generalized estimating equations, with individuals nested within cities, tested differences in cigarettes per day, dependence, quit attempts, and vaping as a function of SGM identity (SGM/non-SGM) and the proportion of SGM residents in the individual's city, adjusting for age and race/ethnicity. **Results:** Cigarettes per day averaged 12.5 ($SD=8.2$); 77.3% of participants smoked within 30 minutes of waking, 24.6% reported a 7-day quit attempt in the past 6 months, and 55.8% reported past-month vaping. Significant interaction terms indicated that specific to SGM participants, residing in cities with lower SGM prevalence was associated with greater likelihood of smoking within 30 minutes of waking ($p=.011$) and vaping ($p=.010$). For both SGM and non-SGM participants, greater SGM population was associated with fewer cigarettes per day ($p=.002$), but not with likelihood of making a quit attempt ($p=.243$); SGM identity X population interactions were not significant ($ps>.415$). **Conclusions:** SGM adult smokers had higher cigarette dependence risk and greater likelihood of vaping than non-SGM smokers in cities with lower SGM prevalence. Future research should examine potential causal factors such as minority stress and SGM-targeted marketing.

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PH-121

GENDER IDENTITY AND TOBACCO USE

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Introduction: Individuals identifying as transgender experience poorer mental and physical health outcomes, likely due to victimization and societal stigma. This group has also been found to use tobacco products at an elevated rate compared to their cis-gendered peers. Reasons for use are not entirely clear and more research is required to determine if psychological distress stemming from transgender identification is the reason for increased tobacco use. **Method:** Students from a large Midwestern university participated in an online survey across three years (sampled in cross-section) from 2016-2018 ($N = 18,682$, $M_{age} = 23$ years, $SD_{age} = 7.71$ years; transgender, $n = 253$). Participants completed a battery of measures assessing symptoms of depression, anxiety, suicidal ideation, and tobacco use. Logistic regression was utilized to examine the effects of transgender identity on cigarette and e-cigarette use. Multivariate regression was used to examine the effects of transgender identity on depression, anxiety, and suicidal ideation. Mediation analysis was utilized to examine the indirect effects of transgender identity on tobacco use, via negative emotion. **Results:** Results indicated higher odds of tobacco products among transgender individuals ($AOR = 2.82$, 95% C.I. 1.26-6.31). A significant effect of transgender identity on e-cigarette ($AOR = 7.18$, 95% C.I. 1.56-33.06) and dual use ($AOR = 5.19$, 95% C.I. 1.37-19.70) was observed, but not cigarette only use. Regression analysis indicated significant effects of transgender identity on anxiety ($b = 3.446$, 95% CI=1.639, 5.253, $p < .001$), depression ($b = 4.140$, 95% CI=2.214, 6.067, $p < .001$), and suicidal ideation ($b = 2.511$, 95% CI=1.477, 3.545, $p < .001$). Lastly, we observed significant indirect effects of transgender identity on tobacco use via increased symptoms of depression (.13, 95% CI=.15,.28, $p < .05$), and suicidal ideation (.22, 95% CI=.15,.28, $p < .05$), but not symptoms of anxiety. **Conclusions:** Results indicate that individuals identifying as transgender report elevated e-cigarette and dual tobacco product use, and experience poorer mental health outcomes compared to their cis-gender peers. Furthermore, tobacco use (e-cigarette and dual use) among individual identifying as transgender appears to be associated with the presence of elevated depressive symptoms and suicidal ideation.



PH-122

COLLEGE STUDENTS' 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:** Using a sequential explanatory mixed-methods design, current JUUL users (n=667) completed a cross-sectional survey in March 2019, then 51 participants completed in-person follow-up interviews in April 2019. Survey questions asked about JUUL-related social media postings and commenting history as well as demographic questions. Interview participants were asked to explain their survey responses then shown the survey results asked for reasons why they and others did not post or comment about JUUL on social media. Qualitative data was coded independently by two coders using NVivo and analyzed for themes. Associations between social media use about JUUL and its use were examined using logistic regression, controlling for demographic characteristics (i.e., age, gender, race, Greek status, and number of five closest friends who JUUL). **Results:** Survey participant (ages 18-24, mean age 20 years, 50.5% female, and 80.6% white) 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. However, social media use among interviewees persisted but changed platforms; private Instagram and Snapchat accounts were used to post both JUUL use and JUUL-focused content without risk of damaging their personal image to family or potential employers. **Conclusions:** How social media use questions are asked is critical for understanding college student promotion of JUULing and social norms. Young adults protect their social media presence by not including themselves in JUUL-focused content; thus the spread of JUULing through private social media like Snapchat or Finstas may not be identified and young adults normalize JUUL-use through memes or images.

FUNDING: Academic Institution

PH-123

DOES E-CIGARETTE USE INCREASE RISK OF COVID-19? YOUTH PERCEPTIONS ABOUT THE EPIDEMIC WITHIN A PANDEMIC

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Background: Youth e-cigarette use is associated with increased risk of COVID-19-related symptoms, testing and diagnosis. However, in the absence of public information campaigns about such risk as well as e-cigarettes still on the market, youth will likely continue using e-cigarettes. We examine youth perceptions of the relationship between e-cigarette use and COVID-19-related risk to identify urgent prevention messages. **Methods:** We conducted a national cross-sectional survey of 13-24 year olds in May 2020 (n=4,351; 50:50 e-cigarette ever-users/never-users) to assess perceptions that e-cigarette use increased: COVID-19 risk, respiratory problems, severe lung disease, lung injury (specifically from using THC); and that users were concerned about falling sick due to COVID-19 given e-cigarette use. **Results:** In our sample, 37.1% ever-users and 22.75% never-users believed that vaping did not increase the risk of Covid-19 because it affects the lungs. Among past 30 day users, 42.8% believed that vaping did not increase the risk of Covid-19 because it affects the lungs compared to 29.43% of ever-users who did not use in the past 30 days. We found that 18.9% of ever-users and 27.0% of past 30-day users believed that young people are not at risk of respiratory problems due to e-cigarettes compared to 9.4% of never-users. 37.75% of ever-users, 48.8% of past 30-day and 19.9% of never-users users felt that there is no hard evidence that vaping nicotine increases the risk of severe lung disease. Despite information and public outreach since the EVALI outbreak, 30.7% of ever-users and 34.4% of past 30-day users believed that using THC in an e-cigarette does not cause lung injuries compared to 15.42% of never-users. Overall, only 21.3% of ever-users and 30.0% of past 30 day users were concerned about falling sick due to COVID-19 because they used e-cigarettes. **Conclusion:** Ever-users and past 30-day users of e-cigarettes believe that these products did not increase the risk of COVID-19 compared to never-users. Since youth perceptions about the risk of COVID-19 are inconsistent with latest scientific evidence, prevention messaging should explain how e-cigarette use may lead to a compromised respiratory system, and affect COVID-19-related outcomes.

FUNDING: Federal; Other

PH-124

UNDERSTANDINGS OF THE CAUSES OF SMOKING-RELATED DISEASE AND SMOKING, VAPING AND QUITTING BEHAVIORS

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Background and aims: A previous study by our team included a task to estimate the relative contributions to smoking-related disease of four 'component causes': 1, nicotine, 2, other substances in unburned tobacco, 3, combustion products, and 4, additives. Under 1% got all four ratings approximately correct. This paper reports a replication using a large representative sample of smokers and recent quitters. **Methods:** ITC Four Country Study 2018. Weighted sample of 12,904, including 10,281 smokers and 2623 recent ex-smokers. We asked for estimates of contribution to disease from combustion, nicotine, the tobacco itself, and additives (with 5 response categories ranging from 'none or very little' to 'all or almost all', plus 'don't know'). **Results:** Most participants gave responses to the four items that did not sum to unity. Only 4% were correct for all four component causes and only 12% rated combustion as clearly the largest source of disease. When we focused on the nicotine-combustion comparison, 39% rated combustion as more important than nicotine, with the remainder demonstrating four kinds of misunderstanding: rating nicotine more harmful than combustion (22%), rating both as equal major contributors (11%), rating both as equal minor contributors (13%), and giving 'don't know' responses for both (16%). Participants who were correct for the combustion-nicotine relationship were the least likely to be daily exclusive smokers (39%) and the most likely to be exclusive vapers (12%) or currently quit (23%). The 'don't know' segment were the worst performing on these three measures (59%, 4% and 15% respectively). **Discussion:** We found low understanding of the contributing causes of harm from smoking. We did not find that the small number who were correct for all four causes were making the best decisions. However, knowing that combustion is clearly more harmful than nicotine was associated with better decisions than most of the kinds of misunderstanding we delineated. By contrast, those admitting ignorance about the harmfulness of both combustion and nicotine appeared uninterested in acting to reduce their risk.

FUNDING: Federal; Nonprofit grant funding entity

PH-125

RACE/ETHNIC DIFFERENCES IN CIGARETTE QUIT RATIOS BY E-CIGARETTE USE

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Significance. Cigarette smoking is the leading cause of cancer, and quitting smoking can significantly reduce cancer risk. There are large racial/ethnic disparities in smoking cessation, with some groups experiencing lower rates of success compared to non-Hispanic Whites. Over the past decade, electronic cigarettes (e-cigarettes) rose in popularity in the United States and were advertised as cigarette smoking cessation aids. **Methods.** We analyzed data from the 2014/15 and 2018/19 Tobacco Use Supplements to the Current Population Surveys to examine the impact of e-cigarette use on quitting cigarettes among adults (age 18+ years) across race/ethnic groups (American Indians/Alaskan Natives, Asians, Hispanics/Latinos, Multiple Race, non-Hispanic Blacks, and non-Hispanic Whites). Quit ratios were defined as the proportion of ever cigarette smokers and who reported smoking 'not at all' at the time of survey completion. **Results.** Results indicate that e-cigarette use has a negative impact on quitting cigarette smoking. Quit ratios were lower for those who reported ever using e-cigarettes (American Indians/Alaskan Natives 29.6%±0.61, Asians 38.3%±0.45, Hispanics/Latinos 37.2%±0.24, Multiple Race 31.3%±0.36, non-Hispanic Blacks 25.8%±0.23, non-Hispanic Whites 32.5%±0.06) compared to those who never used e-cigarettes (47.8%±0.29, 63.7%±0.18, 59.9%±0.12, 62.9%±0.25, 47.6%±0.1, 69.3%±0.03, respectively). **Conclusion.** Population-level quit ratios among those who used e-cigarettes were at least 20-percentage points lower than those who did not use such products to quit. Cigarette smoking cessation programs and regulatory bodies should take into account the substantial negative effect of e-cigarette use on quitting traditional cigarettes across race/ethnic groups. **Research supported by the National Cancer Institute of the National Institutes of Health under award numbers: U54CA132384 & U54CA132379 (San Diego State University & UC San Diego Moores Cancer Center), Grant number 281R-0066 from the Tobacco-Related Disease Research Program.**

FUNDING: Federal



PH-126

THE ILLEGAL EXPERIMENTAL TOBACCO MARKETPLACE II: EFFECTS OF A REDUCED-NICOTINE STANDARDS FOR CIGARETTES

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The implementation of a reduced-nicotine standard for cigarettes may have unintended consequences, such as increased demand for illegal products. Across two experiments, the present study examined the effects of a reduced-nicotine cigarette standard on preference for conventional, regular-nicotine cigarettes available illegally, when the price of reduced-nicotine cigarettes increased. Specifically, Experiment 1 investigated the probability of purchasing illicit regular-nicotine cigarettes, and Experiment 2 examined the demand for legal reduced-nicotine cigarettes and substitution for illegal regular-nicotine cigarettes. In Experiment 1, cigarette smokers from a crowdsourced sample (N=76) chose to purchase in the legal or the illegal marketplace across six cigarette prices (\$0.13, \$0.25, \$0.50, \$1.00, \$2.00, and \$4.00). In Experiment 2, cigarette smokers from a crowdsourced sample (N=49) chose to purchase from a range of legal tobacco products and illegal regular-nicotine cigarettes across the same six cigarette prices. In both experiments, participants were randomized to a reduced nicotine condition or a control condition. In the reduced nicotine condition, participants were instructed that the FDA reduced nicotine in cigarettes and that these cigarettes were less satisfying and failed to diminish craving. In the control condition, participants were informed that the FDA was considering reducing nicotine in cigarettes. Two primary results were observed. Under a reduced-nicotine standard, when reduced-nicotine cigarettes were the only legal cigarette alternative, participants were more likely to purchase from the illegal marketplace (Experiment 1), and spent a proportionally higher budget on illegal regular-nicotine cigarettes than on legal products (Experiment 2) at lower prices. These findings suggest that both price and product standards can alter substitutability between illegal products and legal products. The Illegal Experimental Tobacco Marketplace (iETM) is a methodological extension that supports the continued utility and flexibility of the Experimental Tobacco Marketplace (ETM) framework in tobacco regulatory science.

FUNDING: Federal

PH-127

USE OF COOLING FLAVORS IN E-CIGARETTES AMONG YOUTH

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Significance: E-cigarettes come in many flavors, some which produce a cooling sensation. This includes flavors like menthol and mint, but also extends to flavors like "Raspberry Cooler" or "Strawberry Chill". Menthol has been shown to reduce nicotine's aversiveness in e-cigarettes, but it is unclear if other cooling flavors function similarly. As e-cigarette use rises among youth putting youth at risk for nicotine dependence, it is important to examine how cooling flavors may contribute to youth use. The aim of the current study is to examine differences in e-cigarette use behaviors between youth who use cooling flavors and those who do not. **Methods:** Survey data were collected from 6 CT high schools in Spring 2019. High schoolers who reported current e-cigarette use (past 30-day) were asked if they vape flavors that produce a cooling sensation in their mouth/throat (response options: "yes", "no", "I don't know"). The survey also captured past month nicotine use in e-cigarettes and past month frequency of use. A binary logistic regression model was conducted to examine if vaping cooling flavors was more likely among those who reported past month nicotine use in e-cigarettes and greater frequency of use. Age, sex, school, and race were included as covariates. Students who endorsed "I don't know" regarding cooling sensation were excluded from analyses (16.3%; n=179). **Results:** 51.6% (n=473) of the current e-cigarette users endorsed vaping flavors that produce a cooling sensation. In the adjusted regression model those who reported past month nicotine use in e-cigarettes were more likely to report using flavors with a cooling sensation (AOR: 2.34, 95% CI: 1.51, 3.62). Those with greater frequency of e-cigarette use were significantly more likely to report using flavors with a cooling sensation (AOR: 1.04, 95% CI: 1.03, 1.05). **Conclusion:** Youth who use nicotine containing e-cigarettes and vape more frequently have a greater likelihood of using flavors that produce a cooling sensation. It is important to determine if these observed associations are a function of using these flavors to facilitate nicotine intake and e-cigarette use and whether regulation of these flavors may reduce youth use.

FUNDING: Federal

PH-128

HAS THE COVID19 PANDEMIC GOVERNMENTAL MEASURES IMPACTED SMOKING BEHAVIOR? A STUDY OF 21 COUNTRIES

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Significance: The COVID-19 pandemic has impacted almost all aspects of our lives. We wanted to examine the impact of the pandemic on smoking behaviors across 21 countries. **Methods:** A random sampling approach followed by snowball sampling was used to obtain a wide range of participant characteristics from the general population. The online survey was distributed using a range of methods. The majority of countries from where data was collected had declared a state of emergency for COVID-19. We asked participants between the months of April-June 2020, whether their smoking habits changed during the pandemic and while countries' governmental lockdowns or quarantines were in place. We asked how many cigarettes per day participants smoked prior to the pandemic compared to the present period. Participants were N=9150, mean age was 36.9 (13.3) years and majority female (77.7%). **Results:** Smoking rates ranged from 1.4% in Hong Kong to 32.7% in Romania. A repeated measures ANOVA of Country by Time (before the pandemic vs. currently) of number of cigarettes smoked was significant, $F(36,1533)=4.12, p<.001, \eta^2=.09$. The countries that drove the interaction and presented with significant increases in cigarettes smoked per day were: Cyprus, Greece, Austria, France, Latvia and Ireland. In the rest of the countries, participants did not change their smoking behavior during this period and these were: Switzerland, UK, Turkey, Germany, Spain, Italy, Portugal Finland, Poland, Romania, Colombia, Hungary, USA, Hong Kong and Montenegro. **Conclusions:** Implication of these findings and the impact of different levels of lockdown and quarantine on smoking behavior will be discussed.

FUNDING: Unfunded; Academic Institution

PH-129

CURRENT CIGARETTE USE ENGAGEMENT AND FREQUENCY: A TWO-PART MODEL ANALYSIS

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Introduction: Semi-continuous outcome variables are common in tobacco research. They are usually skewed with a high frequency of zeros representing non-use and the remaining continuously distributed values indicating the frequency of use once engaged in the behavior. Semi-continuous data present several challenges for analysis, in particular accounting for zeros while modeling continuous outcomes (days of use). In this study, we applied a two-part model to explore (1) current smoking (yes/no) and (2) number of smoking days in the past 30 days conditional on current use, among U.S. adult ever smoker. **Methods:** We analyzed data from Wave 4 of the Population Assessment of Tobacco and Health (PATH) Study, and 22,846 adults who reported ever smoking were included in data analysis. We conducted a two-part model to examine the covariates of (1) likelihood of cigarette use in the past 30 days (Part I, a logistic regression model), and (2) number of smoking days in the past 30 days if they used (Part II, a gamma regression model with a log link function). We estimated the effects of covariates on the number of smoking days in the past 30 days, among the current smokers and in the general population, respectively. **Results:** Current smoking and higher numbers of smoking days among current smokers were both associated with higher annual household income, lower education level, full time employment, receiving social assistance, and having health insurance. Other covariates, such as age, race/ethnicity, gender, non-prescriptive drug use, mental health problem, chronic diseases, perceived harm of cigarette use were selectively associated with current cigarette use or days of use. **Conclusion and implication:** Even though many characteristics are associated with both current smoking and number of smoking days, many others were only associated with either current smoking or number of smoking days, not both. Cost-effective cigarette use of prevention and treatment efforts may require targeting different population characteristics.

FUNDING: Unfunded; Academic Institution



PH-130

PATTERNS OF CURRENT TOBACCO PRODUCT USE AMONG US YOUTH

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Objective - Previous research has indicated that concurrent use of multiple tobacco products may be increasingly prevalent among youth. This study examined multiple tobacco product use profiles in a national sample of U.S. youth. **Methods** - Using the data from 2019 National Youth Tobacco Survey (n = 19,000 US middle and high school students), we conducted latent class analysis (LCA) to classify students based on their use of 11 tobacco products (cigarette, cigar, chewing tobacco, e-cigarette, hookah, roll-your-own-cigarettes, pipe, snus, dissolvable tobacco, bidis, heated tobacco) in the past 30 days. We also explored the association between these tobacco use patterns and demographic factors. **Results** - Results of latent class analysis indicated three classes of current tobacco users. Class 1, the Primarily Abstainer class (90.9%, n = 17,272), was characterized by extremely low likelihood of all tobacco products (all <1%) and elevated likelihood of e-cigarette use (11.9%). Class 2, the E-cigarette/Cigarette/Cigar users class (7.9%, n = 1503), was characterized by a high probability of E-cigarette use (79.7%), similar probability of cigar (34.4%) and cigarette (29.5%) use, and much lower probabilities of other tobacco product use. Class 3, the Poly-Tobacco user class (1.2%, n = 225), was characterized by the highest probability among all three classes of using e-cigarette (89.6%), cigarette (81.4%) and cigar (83.6%). This class also had high probability of other product use, for example, roll-your-own-cigarettes (71%), chewing tobacco (61.1%). Compared with Class 1, youth in Class 2 and Class 3 were older, and more likely to be male, and Hispanic or non-Hispanic-non-white. **Conclusion and Implications**: A sizeable proportion of middle and high school students used multiple tobacco products in the past 30 days. E-cigarettes were the most commonly used tobacco product. Youth tobacco product use patterns were significantly associated with demographic characteristics. Future tobacco use prevention efforts should target males, older, and Hispanic or non-Hispanic-non-white youth.

PH-131

COMMUNITY CONNECTEDNESS AND ANTI-TOBACCO INDUSTRY BELIEFS AMONG AFRICAN AMERICAN AND LGBTQ YOUNG ADULTS

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INTRODUCTION Tobacco industry targeted marketing, particularly aimed at African American (AA) and sexual minority youth, perpetuates tobacco-related health disparities among these vulnerable populations. Community connectedness (CC)—the cognitive and affective indicators of community affiliation—has been shown to buffer against tobacco use behaviors. CC may be an effective target for tobacco counter-marketing. The purpose of this study was to evaluate the association between CC and anti-tobacco industry beliefs among AA and lesbian, gay, bisexual, transgender, and queer (LGBTQ) young adults. **METHODS** We conducted secondary analyses of a web-based study focused on the effects of counter-industry advertisements. The sample consisted of 430 AA and 452 LGBTQ young adults ($M_{age}=24$; $SD=4$). An 8-item adapted CC scale measured positive cognitions and affect related to community identification for LGBTQ and AA youth, respectively (range:1-7). Three items measured anti-tobacco industry beliefs (range:1-7): (1) industry targets LGBTQ/AA groups (target belief), (2) it's wrong to do so (moral belief); (3) tobacco use is a LGBTQ/AA health issue (health belief). Beliefs were regressed on CC using OLS regression adjusted for demographics, experimental condition, and smoking status ($\alpha=.05$). **RESULTS** Among the LGBTQ subsample, CC was moderate-high ($M=5.6$; $SD=1.2$) and positively associated with target (unstandardized beta, $b=.23$; squared partial correlation, $r^2=.03$), moral ($b=.30$; $r^2=.08$), and health ($b=.35$; $r^2=.05$) anti-tobacco industry beliefs. Among the AA subsample, CC was moderate-high ($M=5.8$; $SD=1.2$) and positively associated with target ($b=.33$; $r^2=.05$) and moral ($b=.50$; $r^2=.13$) anti-tobacco industry beliefs. CC was not associated with the health belief among AA ($b=.05$). **CONCLUSION** CC was positively associated with anti-tobacco industry beliefs in this sample of young AA and LGBTQ adults. Research is needed to identify antecedents of CC, as well as outcomes related to anti-tobacco industry beliefs (e.g., tobacco use behaviors, support for tobacco regulations).

FUNDING: Unfunded

PH-132

SYSTEM FOR MEASURING INHALATION VOLUME FROM CHEST MOTION

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Significance: Respiratory parameters, specifically inhalation and exhalation flow rates, duration, volume, start and end times, as well as breath-hold duration are key to understanding the amount and location of tobacco smoke or aerosol particle deposition in the lungs. Presently in the literature there is no validated approach to measuring respiratory parameters of tobacco users in their natural use environment. Presented here is work done towards the development and application of such a system, including results from cigarette and hookah users. **Methods**: The Hexoskin (Carré Technologies Inc., Canada) was chosen for monitoring ambulatory respiratory parameters. The Hexoskin is a commercial smart garment equipped with embedded sensors that measure the motion of the thoracic (TC) and abdominal (AB) circumferences. Real-time lung volume displacement was determined from the TC and AB motions using an existing empirical model introduced by Kanno and Mead (1967). The Hexoskin must be calibrated to each user to account for the differences in the physiology between users. The Hexoskin was given to established cigarette (N=4) and hookah (N=5) users for a 24-hour observation period. Users were instructed to smoke ad-lib in their preferred setting. The data was analyzed using in-house software. **Results**: The mean (std. dev.) inhalation volumes were 639.8 (439.5) and 516.0 (431.2) [mL/s] across cigarette and hookah participants, respectively. Likewise, the mean inhalation durations were 1.14 (0.46) and 1.18 (0.49) [s], the mean exhalation durations were 1.71 (0.87) and 1.59 (0.79) [s], and the mean cycle duration were 2.85 (1.04) and 2.77 (1.05) [s]. These results account for both natural breathing and smoking associated ventilation. In both cigarette and hookah users, higher inhalation volumes in the range of 1000-2000 [mL/s] were present and may be attributed to smoking associated ventilation. **Conclusions**: The Hexoskin smart garment has been shown to be a reliable device for measuring ambulatory respiratory parameters. The system can be combined with RIT's wPUM™ topography monitor to enable simultaneous measurement of puffing and respiratory parameters to better understand tobacco smoke and vapor inhalation patterns. **Funding**: NIH NIDA Grant No. 1R21DA050852-01

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PH-133

ASSOCIATION OF THE US OUTBREAK OF VAPING-ASSOCIATED LUNG INJURY AND PERCEIVED HARM OF E-CIGARETTES COMPARED WITH CIGARETTES

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Significance: The recent US outbreak of vaping-associated lung injury (EVALI), linked to vitamin E acetate in THC vaping devices, received extended news coverage worldwide. But media reports often failing to distinguish THC devices from nicotine e-cigarettes. Here, we examine how smokers' perceptions of the relative harm of e-cigarettes compared with cigarettes changed following the outbreak. **Methods**: Current smokers (>16y) were recruited from the Smoking Toolkit Study, a monthly nationally representative survey in England. They were asked whether they think, compared with cigarettes, e-cigarettes are less, equally or more harmful to health. Following a pre-registered analysis plan, we examined associations between timing of the outbreak (Jan-Jul vs. Aug-Dec 2019) and e-cigarettes harm perceptions, before and after adjustment for covariates (sex, age, social grade, ethnicity, and current e-cigarette use). **Results**: 3215 current smokers were surveyed in 2019, 1833 before the outbreak (46.3% women, mean[SD] age=43.5[17.6] years) and 1382 after it (43.7% women, mean[SD] age=43.0[17.8] years). The proportion of smokers who perceived e-cigarettes as less harmful than combustible cigarettes decreased significantly from before (37.0%) to after (30.9%) the outbreak (Risk Ratio [RR]=0.83, 95%CI = 0.76-0.92, $p<0.001$). Conversely, there were significant increases in the proportion who perceived them as equally (39.9% vs. 43.8%, RR=1.10, 1.01-1.19, $p=0.01$) and more (12.7% vs. 17.2%, RR=1.36, 1.15-1.61, $p<0.001$) harmful. Significant differences remained after adjustment. **Conclusions**: Following the US outbreak of vaping-associated lung injury, views on e-cigarettes among smokers in England deteriorated: the proportion perceiving e-cigarette use as less harmful than smoking fell, while the proportion perceiving it as more harmful increased by over a third. These results highlight the importance of clear communication from public health bodies about the relative harm of different nicotine products.

FUNDING: Nonprofit grant funding entity



PH-134

TEENS' RECEPTIVITY TO VAPE PREVENTION MESSAGING DURING THE COVID-19 PANDEMIC

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Significance: Prevention messaging that provides compelling information is needed to address the continued rise in teen vaping. Not only should prevention campaigns for higher-risk teens be responsive to the ever-evolving product landscape, but they must also take into account factors that impact teens' vaping attitudes and behaviors. Current events like the COVID-19 global pandemic have the ability to impact the types of messages that resonate with teens by affecting their values, attitudes, and beliefs. This study tested vape prevention messaging receptivity and preferences with U.S. teens during the pandemic to identify promising messaging approaches for unprecedented times. **Methods:** Online interviews were conducted from May-June 2020 with teens ages 13-18 from two U.S. states (N=46), to inform potential advertisements for the Behind The Haze teen vaping prevention campaign. Interviews included discussions of vaping and health facts, followed by message testing of storyboards of potential future video ads. Teens' perceptions of storyboards were evaluated using perceived effectiveness (PE), a validated measure calculated by averaging six statements rated from (1) strongly disagree to (5) strongly agree (score range: 1-5). **Results:** Discussions with teens revealed that facts about lungs, immunity, and viral infections were perceived as highly relevant and motivating reasons not to vape. Teens liked storyboards that depicted health consequences of vaping, including short-term effects like a decline in athletic performance, shortness of breath, and lung illnesses, which were believable and familiar. Though storyboards did not reference COVID-19 specifically, teens felt that storyboards that described how vaping can increase susceptibility to viruses were timely, important, and reminded them of the ongoing pandemic. As such, storyboards highlighting the connection between vaping and a weakened immune system received among the highest PE scores of all storyboards tested (PE= 3.95, 3.82). **Conclusions:** Vape prevention messages that address lung health, breathing, and a weakened immune system are relevant and motivating to teens. This study underscores the need for updated messaging that capitalizes on current events such as the COVID-19 pandemic, but does so in a realistic, relevant, and timely manner. Understanding and identifying ways to leverage contextual factors such as current events should be incorporated in vape prevention campaign planning.

FUNDING: State; Nonprofit grant funding entity

PH-135

SUCCESSFULLY CONNECTING WITH AT-RISK GROUPS DOES NOT COMPROMISE A MESSAGE'S RECEPTIVITY AMONG THE GENERAL POPULATION

Jessica M. Rath, Siobhan N. Perks, Alexis A. Barton, Elizabeth C. Hair, Donna M. Vallone. Schroeder Institute at Truth Initiative, WA, DC, USA.

Mass media can be an effective tool in reducing disparities. It is well known that many at-risk groups have disproportionately higher rates of tobacco use. The concentrations of use within these groups underscore the importance of reaching at-risk groups. Finite budgets dictate that a balance must be struck in appealing to at-risk groups and relevance to the general population. 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 thetruth.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. As expected, the at-risk groups likely to identify with the ad content over-index with the receptivity 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 "the 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. 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

PH-136

CAN A TOBACCO CESSATION ADVERTISEMENT ALSO DELIVER A PREVENTION MESSAGE?

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Mass media can be an effective tool in reducing or preventing tobacco use. The truth campaign has been proven effective as a tobacco prevention campaign, tailoring messages to youth and young adults who have not yet started smoking or vaping. Recently, for the first time, the truth campaign aired a set of advertisements with a cessation focus, entitled #DitchVape. The main message of #DitchVape was to inform the audience of truth's first ever text-to-quit vaping service and encouraged viewers to ditch their vape device. However, little is known about the ability of these cessation advertisements to simultaneously deliver a prevention message. Online, forced exposure surveys were conducted for five cessation driven advertisements among a sample of 1,505 (300/ advertisement) youth and young adults aged 15-24 years. Participants were randomized to view one advertisement a total of three times and pre-post survey questions assessed participants' change in likelihood (less likely, no change, more likely) to use/try vapes or quit using vapes among three user groups 1) regular vape user 2) trier/occasional user 3) never user before and after viewing the ad. The sample included n=291 regular vape users, n=479 triers/occasional vape users, and n=735 never vape users. Aggregated results for the five advertisements show that the campaign inspired prevention and cessation intentions almost equally. The change in likelihood for prevention (much/somewhat less likely to use/try vapes) was 52% for triers/occasional vape users and 54% for never vape users. Similarly, the change in likelihood for cessation (much/somewhat more likely to quit using vapes) was 46% for regular users. The #DitchVape campaign was able to deliver against a dual objective: cessation and prevention. The latest set of truth advertisements had an impact on the audience regardless of vape user group. The campaign's main message can act both as a cessation message for vape users while at the same time decrease intentions to use for trier/occasional users and never users. A dual-strategy approach to target the full continuum of use is critical when vaping prevalence is high.

FUNDING: Other

PH-137

DEVELOPING AN ANTI-VAPE SCALE TO INFORM MESSAGING STRATEGIES TO PREVENT VAPE USE AMONG YOUTH AND YOUNG ADULTS

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Mass media campaigns can address the increasing vape use among young people. The truth campaign has been proven effective as a tobacco prevention campaign, tailoring messages to youth and young adults surrounding their passion points. In order to inform campaign messaging, we first must determine which attitudes/beliefs are associated with vape use and intentions. A national survey of young people ages 15-24 (n=1,564) was conducted in May 2020 to assess agreement with a series of 46 knowledge, attitude, belief statements and risk perceptions about vaping. Using the procedure outlined by Hornik, items were removed from consideration if there was already high endorsement of the desired attitude (>70%) or the item was deemed not a good match for truth messaging. Following factor analysis, 18 attitudes remained and formed 4 factors: social acceptability, anti-industry, independence ("...not vaping makes me feel powerful"), and non-vaping identity ("...I want to be part of a community that rejects vaping"), plus a perceived risk scale. Factor means were tested for associations with three vape use groups: non-susceptible non-users (NSNU), susceptible non-users (SNU), and current users (CU). Each factor was significantly associated with vape status in a graded manner, with NSNU scoring highest and CU scoring lowest. Social acceptability showed the largest effect ($M_{NSNU}=1.16$; $M_{SNU}=0.63$; $M_{CU}=-0.16$, $F=257.3$, $p<.01$; -2 to 2 scale). A scale formed from all 4 factors ($\alpha=0.92$) also differentiated vape status groups ($M_{NSNU}=0.96$; $M_{SNU}=0.58$; $M_{CU}=-0.01$, $F=190.5$, $p=.01$). Perceived risk was also associated with vape status ($M_{NSNU}=2.14$; $M_{SNU}=1.98$; $M_{CU}=1.52$, $F=63.4$, $p=.01$; 0-3 scale). Understanding which constructs are most closely correlated with intentions not to vape are critical in developing an effective mass media prevention campaign. This



anti-vape scale allows the truth campaign to focus creative efforts on perceived harm, social acceptability, anti-industry, independence, and non-vaping identity attitudes that may decrease intentions to vape. Future, longitudinal research is needed to measure the causal impact of public health messaging on vape use.

FUNDING: Other

PH-138

CHARACTERISTICS OF TOBACCO-RELATED TWEETS ORIGINATING FROM CALIFORNIA COLLEGE CAMPUSES FROM 2015-2019

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Introduction: Daily habits related to college requirements, including class attendance, peer socializing, and residential environments, may present unique risks and benefits pertinent to health behavior. Tobacco-related risks for this population may be reflected in social media conversations. **Methods:** Geo-identifiable tweets were collected from 2015-2019. A basemap of California four-year colleges was used to identify tweets from college campuses. Tweets were then filtered for 38 keywords associated with tobacco-related topics and then manually annotated for types of tobacco/marijuana products, positive or negative sentiment, or first-person observation of another person smoking. Cross-tabulation was used to identify discrepancies between products and colleges, and chi-square tests were used to identify statistically significant proportional differences. **Results:** Out of 83,723,435 geo-identifiable tweets, 1,381,019 originated from four-year CA colleges, with 6,036 containing tobacco-related keywords. 993 tweets related to smoking behavior, with 478 (48.2%) for tobacco, 430 (43.3%) for marijuana, 79 (8.0%) for vaping, and 5 for multiple product types (0.5%). Positive sentiment was detected in 670 (77.5%) tweets, and 140 (14.1%) denoted first-person observations. Sixty-eight college were represented, though the top 20 accounted for 630 (63.4%) of tweets. Out of these twenty colleges, positive sentiment ranged from 56.0% (California State University, Humboldt) to 95.2% (California State University, Los Angeles). Across product categories, positive sentiment ranged from 63.9% (vaping) to 87.4% (marijuana). Finally, first-person observation by product type ranged from 7.7% (marijuana) to 39.2% (vaping). **Discussion:** Relatively high numbers of tweets were identified for tobacco and marijuana with comparatively few for vaping. However, vaping exhibited the highest proportion of tweets containing first-hand accounts of another person's use. Most tweets expressed positive sentiment, especially for marijuana, indicating a need for more effective health promotion activities. Appreciable variation in sentiment was observed between colleges, requiring further exploration.

FUNDING: State

PH-139

ASSOCIATIONS BETWEEN ABSOLUTE AND RELATIVE E-CIGARETTE HARM PERCEPTIONS AND INFORMATION SEEKING BEHAVIORS AMONG US ADULT CURRENT, FORMER, AND NEVER SMOKERS

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Background. E-cigarettes have been framed in some contexts either as "low harm" (an absolute judgment) or as "less harmful than combusted cigarettes" (a relative judgment). We assessed how absolute vs relative e-cigarette harm perceptions were associated with e-cigarette information seeking behaviors in a sample of current, former, and never cigarette smokers. **Method.** We analyzed data on US adults 18 years or over from two cycles of the National Cancer Institute's Health Information National Trends Survey (HINTS-FDA 2015, N = 3,738 and 2017, N = 1,736). Multivariable weighted logistic regression models regressed information seeking behaviors on absolute and relative harm perceptions, smoking status, and interactions between smoking status and each harm perception, controlling for sociodemographics, ever e-cigarette use, and survey cycle. **Results.** Smoking status did not moderate the relationships between absolute or relative harm perceptions and information seeking behaviors, nor was it associated with any of the outcomes. In models without the interaction terms in which we controlled for smoking status, sociodemographics, ever e-cigarette use, and survey cycle, the odds of having looked up information on how to use e-cigarettes to quit smoking were lower for high vs low relative harm perceptions (odds ratio = 0.11, 95% confidence interval = [0.03-0.44]) and significantly different from the odds for high vs low absolute harm perceptions (1.86, [0.52-6.65]). High vs low relative harm perceptions were associated with lower odds of having looked up e-cigarette instructions/tutorials (0.14, [0.03-0.66]), but these odds were not significantly different from the odds for high vs low absolute

harm (0.55, [0.13-2.40]). The odds of having looked up information on the cost of e-cigarettes were lower for high vs low absolute harm perceptions (0.23, [0.06-0.92]), but not significantly different from the odds for high vs low relative harm perceptions (0.47, [0.04-5.95]). **Conclusion.** We find that both absolute and relative perceptions of harm are associated with e-cigarette information seeking behaviors. These associations do not differ based on smoking status. Future research may examine the relationship between harm perceptions and information seeking longitudinally. Understanding how these variables relate to e-cigarette use patterns could inform health communication campaigns.

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PH-140

ANALYSIS OF VAPING CESSATION RESOURCES ON WEB-ASSISTED TOBACCO INTERVENTIONS IN THE U.S.

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The use of Electronic Nicotine Delivery Systems (ENDS) is increasing among young people including those who have not previously used combustible cigarettes. It is unknown how this population accesses information and resources for vaping cessation. Evidence shows the internet has become more accessible for health information in recent years, especially among teenagers. The internet is therefore a viable platform for sharing information and provide resources to those seeking vaping cessation. The utilization and efficacy of web-based resources for vaping cessation are not well studied. A previous study analyzed websites in the North American Quitline Consortium (NAQC) (n=66) and found only 50.0% of these websites mentioned how vaping is detrimental to health, and only 18.2% discussed the harms caused specifically by vaping liquid flavors. The present study focused on websites in the U.S. that can be found outside of the NAQC consortium. Using a previously published strategy, three different search engines (Google, Bing and Yahoo) found a total of 42 non-redundant websites for further analysis of content related to vaping information and resources. Only 13 (31.0%) of the 42 websites provided clear guidance on how to quit vaping. Nearly all of these (12; 92.3%) presented information regarding the harms of vaping, but only five (38.5%) described specifically how vaping liquid flavors cause harm. Ten websites (76.9%) provided information to other resources such as quitlines, links to other cessation websites or recommended talking to your provider about cessation. Only five (38.5%) of the websites included information and resources on vaping during the COVID-19 pandemic. In December, 2019, the federal minimum age for purchasing tobacco products was changed from 18 to 21 years. Web-Assisted Tobacco Interventions have the potential to assist this understudied population in the process of vaping cessation due to this new federal law, and other motivating factors, but evidence suggests WATI information and resources remain limited and understudied.

FUNDING: Federal

PH-141

INITIAL EXPOSURE TO LONGER TOBACCO CONTROL CAMPAIGN MESSAGES MAY MAXIMIZE IMPACT

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Significance: Repeated exposure to televised tobacco control mass media campaign messages can motivate quitting. A sharp rise in online content viewing and more expensive television airtime has driven an explosion, over recent years, in the use of ads that are shorter in length (15 second ads) and that are "skippable" (individuals choose whether to watch the whole ad). There is little evidence about the potential effect of these changes on tobacco control mass media campaign message impact. **Methods:** 1,048 smokers were randomized at time 1 to a message type (tobacco control: 1 of 3 ads vs neutral control: 1 of 3 ads) x message length (15 vs 30 seconds) condition. A week later (time 2), smokers saw their assigned message again, but were randomized to a skippable or non-skippable version. Each time, messages were viewed with another counter-balanced neutral filler ad message, prior to viewing a 2-minute decoy video. Then, message impact responses, previously found to predict quitting behaviour, were measured. Mixed effects logistic regressions examined responses across conditions. **Results:** At time 1, those in the 30-second (vs 15-second) tobacco control condition had greater odds of agreeing the message was relevant, powerful, evoked relevant emotions, made them feel concerned and made them stop and think. At time 2, 39% and 28% of those assigned to the 30- and 15-second skippable condition opted to skip



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their ad message, respectively. At time 2, regardless of skipping condition or skipping behaviour, smokers in the 30-second (vs 15-second) condition had the same greater impact responses as at time 1, but also had greater odds of agreeing the message motivated change. Those in the 15-second condition who skipped at time 2 had lower levels of agreement the message was relevant, powerful and made them feel concerned (vs non-skip condition and vs those who did not skip). These patterns of effects did not emerge for the control condition. **Conclusions:** Initial exposure to 30-second tobacco control messages may lead to stronger responses and may counteract potential negative effects when individuals are given the option to skip.

FUNDING: Nonprofit grant funding entity

PH-142

MESSAGE EFFECT SPREAD BEYOND TARGETED BELIEFS IN ENDS PREVENTION PRETESTING

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Background: Campaign messages often target specific beliefs, but message effects may reach other non-targeted beliefs, a phenomenon we call spreading. Depending on direction of movement, spreading may be a facilitating or disruptive factor. Gauging the potential and direction of spreading in experimental message testing has value for campaign evaluation and outcome forecasting. Methods: This study examines the nature and extent of spreading in the experimental copy testing of ENDS prevention messages produced for FDA's The Real Cost ENDS campaign (N= 1,505). Results: Youth who viewed ads focused on the health consequences of vaping, were more likely to agree or strongly agree with addiction-related Knowledge, Attitude and Belief statements (KABs) such as "Become addicted to vaping". Similarly, youth who viewed ads focused solely on the addictive potential of vapes were more likely to agree with health-related KABs such as "Damage my body". Percent agreement with more unique KABs like "Inhale Toxic Metals" and "Negatively Impact Family and Friends" was statistically higher for all ads compared to the control, regardless of whether the ads had an addiction or health-related focus. Key Findings: While a trend was found of targeted ads moving targeted KABs more than others, when participants were exposed to ads about the harms of ENDS use with strong negative valiance, regardless of the main message of the ad, negative perceptions were transferred to other KABs about ENDS use. Conclusions: This research has implications for understanding campaign effectiveness and developing a strategy for campaign evaluation. While both targeted and non-targeted beliefs moved because of message exposure, for specific, novel KABs, such as "Inhale Toxic Metals", more pronounced movements were detected among those exposed to ads containing messaging about those KABs. From an evaluation perspective, these findings demonstrate that it may be important for campaign messaging to include highly specific and novel beliefs to be able to demonstrate impact. If an ENDS campaign targets only generic beliefs, any evaluation done may have difficulty demonstrating greater movement among targeted beliefs because of the spreading effect.

FUNDING: Federal

PH-143

PERCEIVED AD EFFECTIVENESS COMPARING TWO MEASUREMENT APPROACHES IN ENDS PREVENTION MESSAGING

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Background: The FDA tobacco education campaigns have traditionally used a six-item Perceived Effectiveness (PE) scale to evaluate ad performance (Davis et. al., 2013). Scale items include perceptions of message quality in terms of information processing (e.g., This ad grabbed my attention). Recently research has emerged showing that a brief 3-item scale focusing on perceptions of message effect on more proximal behavior predictors (e.g., This ad discourages me from wanting to vape) is better able to predict actual persuasiveness (Baig et al., 2019). Both sets of items were included in a recent study to compare their performance and explore combining them into an enhanced PE scale. Methods: FDA Center for Tobacco Products conducted copy testing to assess the potential effectiveness of youth ENDS prevention advertisements (N= 1,505). Data from this study was analyzed to assess the commonalities and differences between the message quality and effect perception measures. Results: The two PE measures correlated at .73, $p < .001$, on the individual level. Principal axis factor analysis of the two measures combined (9 items) revealed a single latent factor (eigen value = 5.33, variance explained = 59.2%). OLS regression models controlling for demographic and environmental risk covariates showed advantages of the effect perceptions measure

in predicting post-exposure risk perceptions (standardized $\beta = .33$ vs. $.23$), attitudes toward vaping ($\beta = -.22$ vs. $-.15$), and intention to vape ($\beta = -.25$ vs. $-.06$). At the ad level ($n = 9$), the two PE measures correlated strongly at $.86$, $p = .003$, suggesting similar levels of ability to differentiate ad strength. Conclusion: The two PE measures appeared to produce consistent ratings on both the individual and the ad levels. The advantages of the effect perception measure to predict actual persuasive outcomes on the individual level suggest added value of including it in formative message testing. However, the measures' strong correlation on the ad level suggests similar diagnostic ability. Continued testing with larger and more diverse sets of ads will provide further evidence on the relative utility of these two measures.

FUNDING: Federal

PH-144

PERCEIVED MESSAGE EFFECTIVENESS OF CIGAR WARNING THEMES

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Significance: Over 4 million adults in the US regularly smoke cigars, which cause multiple cancers and other health effects. Cigar warnings address many topics (i.e., health effects of smoking, of second-hand harms, chemicals in smoke, and toxicity of smoke), but little is known about which topics work best. Methods: This study examined cigar smokers' perceived message effectiveness (PME) of different themes in cigar warnings. Between April 23, 2020 and May 7, 2020, we conducted an online study with US adults who used cigars in the past 30 days ($n=777$). Participants were randomly assigned to view 2 out of 14 cigar text warnings and rate the warnings on 3 PME questions (how much does the warning...: 1) make you concerned, 2) make smoking seem unpleasant, 3) discourage you from smoking). We analyzed mean PME scores (range 3 to 15) for each warning and conducted multi-level analyses to assess what themes were most effective, controlling for repeated measures and participant demographics. Results: Warnings about lung cancer, heart disease, and harm to children had the highest PME scores (mean of 11.7, 11.3, 11.2 respectively), while the lowest scores were about carbon monoxide, second-hand smoke, and formaldehyde (mean of 10.6, 10.5, and 10.5, respectively). Multi-level analyses showed that warnings about health effects to the smoker were associated with higher PME ratings, while warnings about chemicals in smoke, second-hand smoke, and toxicity of cigar smoke were associated with lower PME scores. Conclusions: Among a sample of cigar smokers, warnings about health effects were most effective, compared to warnings about cigar smoke toxicity, chemicals in smoke, or second-hand smoke. Regulators and policy makers should consider including cigar warnings centered primarily on health effects in mandated warnings and to a lesser extent rotate other types of warnings to inform users about the broader harms of cigar use.

FUNDING: Federal

PH-145

EFFECTS OF RISK COMMUNICATION ON IQOS PRODUCT ADVERTISING AMONG YOUNG ADULT SMOKERS AND NON-SMOKERS

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Significance: Tobacco companies are developing products that heat tobacco but do not combust it as cigarette alternatives. Marlboro iQOS is one such product available in the U.S. that recently received authorization from the Food and Drug Administration (FDA) to advertise with claims about reduced exposure to toxicants relative to cigarettes. Guided by a theoretical model of tobacco health risk communication, this study tested the effects of modified risk claims and health warnings on iQOS ads among U.S. young adults. Methods: U.S. young adult (18-30 yrs, $n=1328$) non-smokers and current smokers recruited from a consumer research panel viewed iQOS ads in a 4 (claim variations or none) x 3 (warning variations or none) between-subjects experiment. Measures assessed attention to stimuli, recall of risk content, discouragement, and intentions to use iQOS. Analyses examined the effects of the conditions on outcomes and mediation pathways to intentions. Results: In initial analyses there were no differences between non-smokers and smokers on outcomes, so subsequent analyses combined these groups. Compared to no warning, presence of any warning was associated with greater



discouragement from using iQOS ($p < .05$), but there was no effect of claims. There were no significant effects of claims or warnings tested on intentions to use iQOS. Mediation analyses showed two indirect paths to intentions: 1. Exposure to any warning decreased intentions to use iQOS through attention to the warning and greater discouragement ($B = -0.001, p < .05$) and 2. Exposure to any claim increased intentions to use iQOS through attention to the claim, recalling the product as "safe," and less discouragement ($B = 0.003, p < .05$). **Conclusion:** Risk communication features on heated tobacco product ads, including claims about reduced risks and health warnings, can affect intentions to use the product when they are attended to and recalled by consumers. As tobacco manufacturers market heated tobacco products with modified risk claims, research on effects of claims and health warnings among groups at risk of initiating use and those who may transition from other tobacco products (e.g., cigarettes) is warranted.

FUNDING: Federal

PH-146

THE EFFECT OF BRAND EQUITY IN PREVENTING VAPE USE AMONG YOUTH AND YOUNG ADULTS

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Significance: Public health mass media campaigns have been effective at changing population-level attitudes and behaviors. Health campaigns are implementing branding strategies which can influence how viewers interpret and interact with a message. Launched in 2000, the truth campaign was designed as a branded, national anti-smoking media effort. This was one of the first health-related campaigns to embrace the building of a brand to further amplify its message. Previous research supports that strong brand equity is associated with stronger anti-tobacco attitudes and behaviors; however, brand equity has not been studied as it relates to anti-vape campaigns. **Methods:** This study examines the effects of brand equity over time of the truth anti-vape campaign using the sample extracted from the Truth Longitudinal Cohort, a nationally representative, longitudinal cohort of youth and young adults. Following factor analysis, the brand equity scale consists of four constructs formed by 17 items: brand loyalty, leadership/popularity, brand personality, and brand awareness with higher scale scores representing more brand affinity. Mean scores on a 17-item anti-vape scale, intentions to vape in the next year, and current vape use were also collected. The analyses utilized $N = 2,197$ nicotine naïve and logo aware 15-24-year-olds who had never vaped at their Wave 7 survey; when the outcome was current vape use, the sample was $N = 2,493$. Multiple and logistic regression models determined the relationship between brand equity from respondents at Wave 7 (Spring 2018) and respondent vape attitudes, intentions, and behaviors at Wave 9 (Fall 2019). All models controlled for demographic characteristics and cigarette use. **Results:** Respondents with greater scores on the brand equity scale reported stronger anti-vape attitudes ($N = 2197, \beta = 0.16, p < 0.001$). Higher brand equity was also associated with lower likelihood of vape behaviors. Greater brand equity scores were significantly associated with lower intentions to vape in the next year ($N = 2197, OR = 0.69, p = 0.001$) and lower past 30-day vape use ($N = 2493, OR = 0.70, p < 0.05$). **Conclusion:** Strengthening brand equity is an effective strategy for influencing anti-vape related attitudes, intentions, and behaviors, much like it is for anti-smoking campaigns.

FUNDING: Other

PH-147

CHANGING THIRDHAND SMOKE AWARENESS AMONG CALIFORNIA ADULTS THROUGH A FACEBOOK HEALTH EDUCATION CAMPAIGN

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BACKGROUND: Thirdhand smoke (THS) is the toxic tobacco residue that persists on surfaces in indoor environments after smoking has stopped. Exposure to THS can increase tobacco-related health risks, especially among children. Decades of tobacco prevention campaigns have successfully informed the public about the harms of secondhand smoke, but people remain largely unaware of THS and its negative health effects. **SIGNIFICANCE:** The purpose of this quasi-experimental study was to evaluate the effectiveness of a public health campaign at increasing THS awareness, as measured by knowledge, attitude, efficacy, and behavior. **METHOD:** The persuasive strategy emphasized THS risk factors, exposure routes, and impacts on people, pets, and property. After development and focus-group testing, seven campaign messages

were disseminated as Facebook ads, running repeatedly over a four-month intervention period. Facebook filters were used to target users most likely to be interested in the ad. To test campaign effectiveness, California adult nonsmokers of low to middle socio-economic status with an interest in children, travel, pets, cars, apartments, or real estate were recruited via Facebook. Participants ($n = 1086$) were invited to complete a monthly survey at baseline (1 survey), intervention (4 surveys), and post-intervention (2 surveys). The survey, sent to participants, via e-mail, assessed knowledge, attitudes, efficacy, behavior, and demographic characteristics (monthly participation range: $n = 238$ to $n = 326$). **RESULTS:** Campaign evaluation employed a mixed linear regression model (controlling for gender, age, smoking history, and initial awareness of THS). Compared to baseline, participants' self-reported knowledge (*Cohen's d* = .21, $p < .001$), attitudes (*Cohen's d* = .21, $p < .001$), and efficacy (*Cohen's d* = .23, $p < .01$) increased by campaign's end. There were no significant changes in reported behavior. **CONCLUSION:** The present study is the first to test a tobacco prevention campaign focused on THS. Results suggest the campaign increased public knowledge, attitudes, and efficacy regarding THS. Findings offer continued support to social media-based approaches for tobacco prevention campaigns.

FUNDING: State

PH-148

PERCEPTIONS OF THE TOBACCO INDUSTRY AMONG YOUTH AND YOUNG ADULTS

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Significance: As smoking rates in the U.S. have declined since the 1960's, favorable perceptions of tobacco companies have also declined. Novel tobacco product use, including e-cigarette (e-cig) use, is on the rise among youth. This analysis examines how tobacco companies are viewed among youth and young adults in this evolving market. **Methods:** The sample consists of $n = 9,557$ 15-28 year-old's who participated in Wave 9 (Sep-Dec 2019) of the Truth longitudinal cohort, a nationally representative, address-based and probability-based sample. Participants were asked if tobacco companies use candy or fruit flavors to get young people to try e-cigs and if tobacco companies are honest about the health effects of their products. Response options included "True," "False," and "Don't know." Weighted bivariate analyses were conducted to understand differences in tobacco use groups. Significant differences were evaluated via Rao-Scott Chi-Squared tests. **Results:** Most agreed that tobacco companies use flavors to get young people to try e-cigs (79%) and disagreed that they are honest about the health effects of their products (69%). 70% of current, 78% of former and 82% of never smokers agreed that flavors are used to target youth to try e-cigs. 59% of current, 67% of former and 71% of never smokers disagreed that tobacco companies are honest. 76% of current e-cig users and 82% of non-users agreed that flavors are used to target youth to try e-cigs. 64% of current e-cig users and 68% of non-users disagree that tobacco companies are honest. All differences were significant at $p < 0.001$. **Conclusion:** Even with the rise of novel products targeted at youth and young adults, they expressed strong anti-industry sentiment. However, these beliefs are not as strongly held among those using the products. Future research should focus on further understanding the relationship between favorable industry perceptions and product use among youth targeted by the tobacco industry.

FUNDING: Other

PH-149

EXPLORATORY ANALYSIS OF ELECTRONIC CIGARETTE RELATED CONTENTS ON INSTAGRAM OBSERVATIONAL STUDY

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Background Instagram is a popular social networking platform for users to upload pictures to share their experiences. Instagram has been widely used by vape companies and stores to promote electronic cigarettes (e-cigarettes), as well as by public health entities to communicate with the public about the risk of e-cigarettes use (vaping). **Objective** We aim to characterize current vaping-related content on Instagram through descriptive analyses. **Methods** From Instagram, 42,951 posts were collected using vaping-related hashtags in November 2019. The posts were grouped as 'pro-vaping', 'vaping-warning', 'neutral-to-vaping' and 'not-related-to-vaping' based on their attitudes to vaping. From these Instagram posts and corresponding 18,786 unique Instagram user accounts, 200 pro-vaping and 200 vaping-warning posts, as well as 189 pro-vaping and 155 vaping-warning user accounts, were randomly selected for further hand-cod-



ing. Furthermore, the follower count and the media (post) count of the Instagram user accounts, as well as the like count and hashtags of the posts, were compared between pro-vaping and vaping-warning groups. **Results** There were more posts in the pro-vaping group (41,412 posts) than the vaping-warning group (1,539 posts). The majority of pro-vaping images were *product display* ($n=163$, 81.5%), and the most popular image type in vaping-warning was *educational* ($n=95$, 47.5%). The highest proportion of pro-vaping user account type was the *vaping store* ($n=110$, 58.1%), and the *store* account type had the most average posts (10.33 post/account). The top three vaping-warning user account types were *personal* ($n=79$, 51%), *vaping-warning community* ($n=37$, 23.9%), and *community* ($n=35$, 22.6%), in which the *vaping-warning community* has the most average posts (3.68 posts/account). The pro-vaping user accounts had more follower count (median=850) and media count (median=232) than vaping-warning user accounts (median=191, 92 respectively). The pro-vaping posts had more like count (median=22) and the number of hashtags (mean=20.39) than vaping-warning posts (median=12, mean=7.16 respectively). **Conclusions** Instagram had been dominated by the pro-vaping content, and the pro-vaping posts and user accounts seem to have more user engagement than vaping-warning. These results highlight the importance of regulating e-cigarette posts on social media, and the urgency of identifying effective communication with the public about the health effects of e-cigarettes to ameliorate the epidemic of vaping in youth.

FUNDING: Federal

PH-150

CHARACTERIZING CALIFORNIA LICENSURE STATUS AND TOBACCO USER EXPERIENCES WITH ADVERSE EVENTS USING BUSINESS LISTING PLATFORM YELP!

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Introduction: Crowd-sourced business listings have become a popular method for customers to choose goods and services. Various tobacco products, including Electronic Nicotine Delivery Systems (ENDS), are included on these crowd-sourcing websites, which also provide ratings on products and information on tobacco use experiences. **Objective:** To characterize tobacco user experiences for licensed and unlicensed CA tobacco and vape shops on Yelp! **Methods:** We cross-referenced CDFTA (California Department of Tax and Fees Administration) licensed tobacco, vape, and head shop retail stores with publicly available California business listings on the popular crowd-sourced business listing and review platform Yelp! using big data approaches. We matched store listings for those listed in CDFTA (licensed) and those that were not listed (unlicensed) and compared characteristics of both groups. We extracted metadata associated with store/account details and also analyzed user comments and ratings associated with stores for discussion of tobacco-related complaints and adverse events. **Results:** CDFTA public license listings from 2015-2020 provided a total of 31,251 CRL (California Retail Listing) shops registered in California. After collecting account information on retail accounts on Yelp!, a total of 4315 shops were categorized as tobacco, vape or head shops. Of these accounts 55.3% ($n=2387$) were identified as licensed and 44.7% ($n=1928$) did not match and were classified as unlicensed. Licensed stores received a slightly higher average user rating (3.94 out of 5) compared to unlicensed shops (3.72). 3501 unique unlicensed comments were reviewed and extracted, with reoccurring themes including discussion about defective products, fake products, and adverse events associated with lung injury such as coughing or difficulty breathing with or without hospitalization. In contrast, the comments associated with licensed stores predominantly discussed customer service issues. **Conclusion:** Close to half of Yelp! tobacco stores reviewed were not in CDFTA's license database. Self-reported tobacco user experiences appeared to differ in content and severity based on whether an account was licensed. Results have potential to identify unauthorized stores and adverse events associated with their products and services.

FUNDING: State

PH-151

ASSOCIATION OF EXPOSURE TO JUUL SOCIAL MEDIA ADVERTISEMENTS WITH PRODUCT USE AND BELIEFS

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Significance: Social media is an impactful method of marketing nicotine and tobacco products such as JUUL. Although the content of JUUL social media posts and adver-

tisements has undergone consistent surveillance, it remains unclear whether degree of exposure to JUUL social media ads is associated with use of or beliefs about this product. We hypothesized that greater exposure to JUUL advertisements via social media would be associated with history of JUUL use, positive beliefs about JUUL, and perceived likelihood of future JUUL use. **Methods:** A survey was administered to 1001 undergraduate students at two universities in Southern California from February 2019 to May 2019. The survey assessed exposure to JUUL social media advertisements via Instagram, Facebook, Twitter, Snapchat, and Youtube using five-point Likert scales. Individual scores for each social media channel were added together to create a composite measure of social media advertisement exposure. Independent samples t-tests and bivariate correlation analyses tested the significance of hypothesized relationships. **Results:** Ever-users of JUUL ($n = 288$) endorsed more frequent exposure to JUUL advertisements across all five social media platforms (p 's $< .043$) and on the composite social media variable ($p < .001$) than never-users of JUUL ($n = 713$). Contrary to hypotheses, more frequent exposure to JUUL social media ads was correlated with stronger beliefs that JUUL is as harmful to health as cigarettes (p 's $\leq .023$) and more addictive than cigarettes (p 's $\leq .002$). Consistent with hypotheses, more frequent exposure to JUUL social media ads was associated with stronger perceived likelihood of JUUL use in the next month (p 's $\leq .008$) and in the next year (p 's $\leq .001$). **Conclusion:** More frequent exposure to JUUL advertisements via social media platforms may promote use of JUUL products by young adults, although likely not through promoting positive beliefs about the product's efficacy, safety, or potential for harm reduction. Future research directions include evaluating whether exposure to advertisements via social media predicts initiation or escalation of JUUL use.

FUNDING: Unfunded

PH-152

DOES EXPOSURE TO VAPING ADVERTISING AND PROMOTIONS INFLUENCE VAPING UPTAKE AMONG ADULT SMOKERS? A LONGITUDINAL STUDY IN MEXICO, WHERE VAPING IS BANNED

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Introduction: Advertising exposures, especially to online ads, have been associated with the rise of vaping among youth. This longitudinal study assesses whether exposures to online and offline advertising, and promotions are linked with subsequent trial of vaping products among exclusive smokers in Mexico, a country with a vaping ban. **Methods:** Data were analyzed from ongoing surveys of adult smokers recruited through an online commercial panel for marketing research, from November 2018 to March 2020, surveys conducted every 4 months. Analytic sample included exclusive smokers who were followed up at least once ($n=1,552$). Logistic models regressed trial of vaping by follow-up (time "t+1") on exposure variables from the prior survey (time "t"). These variables considered: Offline ads in four levels based in exposure from different sources (yes/no): 1.mail, 2.pubs and bars, 3.ads inside stores, 4.ads outside stores, 5.festivals, sport events or concerts, 6.temporary outlets; online ads in e-mail and social media (yes/no); and promotion efforts as price offers, discounts, or coupons (yes/no). Models were adjusted for sex, age and educational attainment, smoking and vaping among family and friends, and social acceptability of vaping. **Results:** At follow-up, 16.1% of former exclusive smokers had tried vaping. A dose response effect was found for offline ad exposure (1-2 sources AOR=2.6, 95% CI=1.9-3.7; 3-4 sources AOR=3.3, 95% CI=2.1-5; 5-6 sources AOR=5.6, 95% CI=3.1-10.1). Online ads (AOR=3.0 95% CI=2.3-4.1) and promotional efforts (AOR=4.8 95% CI=2.9-6.5) also have an impact. **Conclusions:** Both online and offline advertising, as well as promotional efforts, are related to trial of vaping products among adult smokers in Mexico. Future research should determine whether vaping helps Mexican smokers quit and if the potential benefits outweigh the potential risks of increased vaping amongst Mexican youth. *This study was supported by 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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PH-153

FRAMING OF PERCEIVED EFFECTIVENESS OF HEALTH MESSAGES ABOUT SMOKING AND PREGNANCY AMONG LOW-INCOME WOMEN OF REPRODUCTIVE AGE

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Significance: Despite interest and attempts to quit being equal by sex, women have long-term cessation rates lower than men. Further, an estimated 20% of women do not quit smoking during pregnancy. The 2001 Surgeon General's Report recommended reporting gender-specific cessation data to better understand sex differences in smoking cessation. Little research on cessation messaging has focused on gender-specific reporting. This study aimed to better understand how graphic warning labels may assist the quit process for women of reproductive age. **Methods:** Women of reproduction of age currently using tobacco were recruited from Amazon Mechanical Turk ($n=187$). Participants were shown a series of textual and image-based messages about smoking cessation, family, and tobacco use during pregnancy, each paired with a gain- or loss-framed textual message and image. Participants' responses were rated for perceived effectiveness using a validated and reliable scale, including four subscales: the believability of the label, how much each label grabbed their attention, how much negative affect they felt when viewing the label, and the perceived health risks, which includes intention to quit. A total of 12 labels were presented in a random order. Demographics were collected at the end of the survey. **Results:** Adjusting for multiple comparisons, paired two-sample t-tests revealed that loss-framed labels elicited significantly greater negative affect, more believability, more attention, and more perceived health risks compared to their gain-framed counterparts ($p < 0.001$). One gain-framed message, a detailed message on bodily repair during cessation, performed better than all loss-framed messages on believability, attention, and perceived health risks, but still evoked less negative affect. **Conclusions:** Loss-framed labels are perceived by tobacco users as an effective strategy for messaging among women of reproductive age. Gain-framed messages may be more appropriate for this group. Future directions should further examine settings where gain- and loss-framed messages are most effective in promoting tobacco cessation.

FUNDING: Federal

PH-154

BEYOND STATISTICAL MEDIATION - USING A "PARALLEL ENCOURAGEMENT" DESIGN TO ESTABLISH BELIEF AS A CAUSAL MEDIATOR FROM CIGARETTE AD EXPOSURE TO ATTITUDES AND INTENTIONS

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Significance: Previous research and available theory show that pro and con beliefs created by cigarette ads mediate the impact on attitudes and intentions. Typically, this mediated sequence is based on statistically sound patterns. But a statistical pattern of causality to outcomes is causally weak due to lack of random assignment at the mediator phase. To establish the causal sequence from the belief-as-mediator to the outcomes, this study utilizes the parallel encouragement (PE) design which randomly assigns subjects to take a particular value of the mediator by manipulating the mediator instead of only measuring the mediator as in the conventional approach. Establishing belief as an actual causal mediator and not just a statistical mediator is crucial in designing public health interventions that focus on manipulating actual causes rather than ones that are actually effects. **Methods:** The PE design in this study was carried out by subtly manipulating the expected mediator after exposure to Natural American Spirit (NAS) ads. Manipulation of the expected mediator was through a simple reaction time word task. Positive and negative words 'encourage' beliefs in different directions without directly evoking thoughts about NAS cigarettes. The words used in the game were based on 1) thematic relevance and non-relevance to beliefs known to be mediators of NAS ad content, and 2) valence in connotation. Then, these words were combined in different ratios by word types to constitute each of 2 (relevance - relevant vs non-relevant) x 3 (valence - balanced vs positive vs negative) encouragement treatment conditions. After viewing the ad, 1,403 current and former smokers were randomly assigned to one of these 6 encouragement conditions or the control (similar reaction task identifying word vs non-word). After the encouragement manipulation, beliefs, attitudes, and intentions regarding NAS cigarettes were assessed. **Results:** Reaction time and identification index for the stimuli (words) have shown a successful manipulation; accuracy of each word's valence matched the expected valence (91.5%) in all encouragement conditions. Hypothesis testing with planned contrasts is in progress.

FUNDING: Federal

PH-155

ASSOCIATION OF E-CIGARETTE ADVERTISEMENTS AND HOUSEHOLD MEMBERS' TOBACCO USE WITH E-CIGARETTE USE: NATIONAL YOUTH TOBACCO SURVEY 2014-2018

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Purpose: E-cigarette use has rapidly grown in U.S., especially among youth. Previous research indicates that e-cigarette marketing and household members' tobacco use among other factors may have positive associations to youth e-cigarette use. We expand on this further and look at these as well as other factors associated with e-cigarette use using nationally representative data. **Methods:** We pooled data from the National Youth Tobacco Survey (2014 - 2018), a cross-sectional survey of middle and high school students in the United States. We focused on how exposure to advertisements/promotions as well as tobacco products exposure at home may influence e-cigarette use behaviors. Multivariate logistic regression models were fit to assess correlates of e-cigarette ever use and past 30-day use using two sets of model specifications. Data was analyzed using the survey package in R. **Results:** Almost one quarter (23.2%) of youth were ever e-cigarette users; while approximately 10% of youth reported using e-cigarettes in the past 30 days. High school students had almost three times the rate of ever e-cigarette use (32.0%) compared to middle school students (11.7%). Compared to youth not reporting e-cigarette advertisements/promotions exposure, those who were exposed to 1-2 or 3-4 distinct sources of e-cigarette advertisements/promotions are more likely to be ever e-cigarette users [OR= 1.32 (CI: 1.25, 1.40; $p < 0.001$) and OR=1.49 (CI: 1.39, 1.58; $p < 0.001$) respectively]. Respondents living with household members who are e-cigarettes users (both exclusive and non-exclusive) have significantly higher odds of being ever users [OR = 5.88 (CI: 5.19, 6.67; $p < 0.001$) and 5.82 (CI: 5.34, 6.35; $p < 0.001$) respectively]. Results were similar for past 30-day e-cigarette use. **Conclusion:** Our findings indicate that high school, exposure to e-cigarette advertisements/promotions and having household members who use any tobacco product including e-cigarettes, are all positively associated to ever and past 30-day e-cigarette use. Regulatory measures that limit e-cigarette advertisements/promotions and encourage nicotine free home may contribute towards curbing further rise in e-cigarette use among youth.

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PH-156

PERCEPTIONS OF CIGARETTE PICTORIAL HEALTH WARNING LABELS AMONG ADULTS IN JORDAN

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Significance: Pictorial health warning labels (PHWLs) on cigarette packages encourage smoking cessation and prevent initiation but are most effective when adapted to the cultural milieu. We developed and tested 24 PHWLs in Jordan focusing on 4 risk themes (general health, female-specific, male-specific, and child secondhand exposure). **Methods:** 1006 adults (80% non-smokers, 11% cigarette-only smokers, 9% cigarettes + other tobacco products) viewed PHWLs and rated their perceptions of each image on a 1-5 scale. Smokers and non-smokers rated how images affected their motivation to quit (cessation motivation) or not start smoking (prevention motivation), respectively. Attention, knowledge, and fear also were rated. ANCOVAs, adjusted for age and education, were used to compare ratings across the 4 risk themes and assess sex and smoking status effects. **Results:** Cessation and prevention motivation ratings were uniformly high across the 4 risk themes, ranging from 3.3-4.6 on a 1-5 scale. Cessation motivation for each of the 4 theme groups did not differ by smoking status (cigarette only vs. cigarette



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+ other products) or sex (all p -values $>.06$). Prevention motivation was higher for women than men for three of the four themes (general disease, female-specific, and second-hand smoke-related; p -values $<.0001$). In contrast, men who smoked cigarettes had higher ratings than women on attention, knowledge, and fear for male-specific PHWLs. **Conclusion:** Participants, regardless of sex or smoking status, were responsive to the PHWLs, rating motivation to quit or not initiate smoking, as well as the extent to which the PHWLs grabbed their attention, increased their knowledge, and elicited fear, in the moderate to high range. Sex differences were observed in responses to PHWLs that featured male-specific health risks suggesting that it is advantageous to target images of male-specific tobacco related diseases to men, such as erectile dysfunction. These results indicate that this set of PHWLs may be useful for smoking prevention/cessation efforts among adults in Jordan.

FUNDING: Other

PH-157

TEEN VAPING PEER INFLUENCE

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Significance: Vaping is popular among adolescents. Previous research has explored sources of information and influence on youth vaping, including marketing, ads, family, peers, social media, and the internet. This research endeavors to expand understanding of peer influence. **Methods:** In August-October 2017, youth aged 13-18 completed an online survey to quantify ENDS behaviors and attitudes ($n=3,000$) and were invited to participate in follow-up online research in November-December 2017 to probe qualitative context around perceptions and motivations ($n=76$). This analysis focused on the ENDS users, defined as having ever tried any ENDS product, from the survey ($n=1,549$) and the follow-up research ($n=39$). **Results:** Among survey respondents, friends were the most common source of vapers' first ENDS product (60%), followed by family (16%), someone else (8%), or store (8%). Most survey respondents tried their first ENDS product while "hanging out with friends" (54%). Much less frequent responses were by themselves (14%), with family (10%), at school (8%), or at parties (7%). Among follow-up research participants, the theme of socializing was also prominent: one of the chief reasons they vaped the first time was because it seemed "popular"; one of the reasons they still vape was being "together with friends"; and one of the best things about vaping was "socializing with friends." Many participants conveyed the importance of peer influence with quotes such as the following: "I know a lot of people who vape. It's pretty popular with most of my friends. If my friends didn't vape, I doubt I would have ever started." "My friends and I vape together almost every time we are together. If they did it less I probably would too." **Conclusions:** These findings support the premise that peer influence is a primary social influencer and reinforcer for vaping. Being included in a popular activity appears to be a strong driving force. Future research regarding two areas would add value to our understanding of peer influence: 1) the impact of social distancing during COVID-19 on teen vaping habits and 2) the influence non-vapers may have on preventing their friends from vaping.

FUNDING: Federal

PH-159

REACTIONS TO ENDS PREVENTION MESSAGES RESULTS FROM A SECOND WAVE OF QUALITATIVE RESEARCH USED TO INFORM FDA'S YOUTH PREVENTION CAMPAIGN

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Background: Youth ENDS use is a major public health concern. Large-scale tobacco prevention campaigns are a proven strategy to prevent tobacco use. There is less research on what types of ENDS prevention messages are most effective. This study addresses this need by reporting youth reactions to creative concepts aimed at preventing ENDS use. **Methods:** In the Summer of 2019, 24 focus groups were conducted with 159 teens (12-17) at-risk for or experimenting with ENDS in four cities across the United States. During focus groups, youth answered questions about their knowledge and perceptions of ENDS. They also responded to creative concepts dealing with: 1) ENDS may contain harmful and potentially harmful chemicals 2) the addictive nature of ENDS 3) nicotine cravings can distract you, and 4) youth who use ENDS are more likely to use cigarettes. Transcripts were analyzed using a thematic analysis approach. **Results:** Key takeaways during the knowledge and perceptions discussion included: 1)

youth were most familiar with the brand Juul, but other products such as Suorin and Blu were also popular 2) youth described being able to get ENDS on-line, in stores, or at school from older youth 3) ENDS use among peers felt ubiquitous as even "valedictorians vape", and 4) youth described instances in which peers exhibited signs of addiction to ENDS. During the discussion of creative concepts, youth responded favorably to concepts focusing on harms of ENDS, particularly potentially inhaling metal particles into the lungs. Youth also responded favorably to concepts framing addiction as loss of control, and related feelings of regret. Youth did not find the "distracting" effects of addiction compelling. Additionally, care needs to be taken when messaging on escalation from ENDS to cigarettes to ensure this message doesn't detract from risks of ENDS use alone. **Conclusions:** These focus groups aided in our understanding of what ENDS prevention messages could be most persuasive to teens. As public perceptions and knowledge of ENDS are constantly changing, it is useful to periodically assess what types of ads may be most persuasive to youth.

FUNDING: Federal

PH-160

CHARACTERISTICS OF TEXT AND PICTORIAL TOBACCO WARNINGS WORLDWIDE

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Significance: Many countries around the world have adopted pictorial warnings for cigarettes, yet no systematic research has evaluated the key characteristics of currently implemented warnings. We searched existing warnings databases, developed a library of combustible tobacco warnings, and methodically coded warning characteristics. **Methods:** Warnings for combustible tobacco from countries that have English as an official or de facto language were compiled and abstracted into a database. Warnings were coded for text and pictorial characteristics. Basic descriptive statistics were generated to describe the overall landscape of combustible warnings in English. **Results:** We identified 274 unique English language text and pictorial warnings from 26 countries around the world. Of the warnings identified, nearly all texts included pictorials (93%). Warning text statements mostly described health effects to the respiratory (27%), circulatory (19%), reproductive systems (19%) and nervous systems (14%). Warning texts referring to specific health effects most often mentioned cancer (28%). Most text warnings (87%) referred to tobacco products broadly, and 10% mentioned a specific tobacco product, such as "cigarette". Quitline phone numbers or websites were included on almost half (44%) of text warnings. Most pictorials in warnings (97%) were in color, and half (54%) were judged as graphic depictions. Two-thirds (66%) included a single person, usually an adult (40%), with children represented less frequently (19%). More than 1 in 5 warnings included a smoking cue. **Conclusions:** The great majority of English language warnings include pictorials, most frequently with graphic representation. Countries wanting to strengthen their warnings may use this research to examine existing strategies to increase warning attention (e.g., including people), and to decrease possible unintended consequences, such as use of smoking cues in warnings that may increase smoking urges.

FUNDING: Federal

PH-161

ONLINE ADVERTISING MESSAGES FOR TOBACCO PRODUCTS IN A WESTERN NEW YORK METROPOLITAN AREA

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Over the past few years vaping prevalence has increased in the U.S. as people either switch to electronic cigarettes from traditional cigarettes thinking they are safer or due to influence by tobacco companies' strategic marketing efforts. In addition to an increase of electronic nicotine delivery systems (ENDS) the nicotine vapor industry itself has boomed with thousands of new "vape shops". The majority of consumers who use ENDS also use social media networks and follow ENDS brands. With the rise of vape shops and successful marketing strategies to create a trusted community of vapers, it is important to study observable social media strategies to better understand their impact on consumer behavior and addiction. The present study explored vape shops' Facebook marketing strategies in the Rochester, New York Metropolitan area before and after a state wide flavor ban that went into effect May 2020. Another key secular trend greatly impacting marketing strategies and success is the COVID-19 pandemic.



In this study, we examined 15 vape shops' Facebook pages in or around Rochester from January 31, 2020 to July 1, 2020. Using open coding thematic analysis, Facebook posts were theme coded into eight major themes with subthemes and categorized into two time frames - before and after the May 2020 flavor ban. Identified Facebook theme categories were "Promotion", "Flavor", "Community", and "Regulations". After the flavor ban, vape shops promoted, via promotion posts, their products fewer times than prior to the flavor ban (51.47% vs 67.90%). There was also a substantial decrease in posts about vaping flavors: from 17.70% to 8.82%. This is likely due to their inability to legally sell flavored nicotine products. Substantially fewer posts, post-ban, were observed in theme categories "Community" and "Regulations" categories, which likely reflects a decreased need to challenge flavor regulations and a decreased need to ask their customer communities for support for such challenges. Interestingly, a decrease in the prevalence of COVID-19 related posts was observed over time, likely reflecting the various retail re-opening phases in New York State.

FUNDING: Federal

PH-162

ENCOUNTERS AND CHARACTERISTICS OF PRO- AND ANTI-TOBACCO MESSAGES IN REAL TIME AMONG LOW SOCIO-ECONOMIC POSITION GROUPS

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Background: Tobacco advertising disproportionately targets people in low socio-economic positions (SEP), causing higher rates of use in this population. To mitigate this, anti-tobacco public health education campaigns are implemented. Yet, little is known about the characteristics of these messages. **Methods:** Individuals in low SEP groups (N=95), aged 18-34 years old, who were smokers and non-smokers, from the Boston and Houston areas, took part in a mobile health study. They submitted images of tobacco-related messages they encountered (e.g., tobacco advertisements, public health campaigns) via an application on their mobile phone in real time for a 7-week period. This resulted in a sample of 131 images. Two trained coders analyzed the images for message characteristics. **Results:** Of the submitted images, 80 were pro-tobacco and 51 were anti-tobacco. Of the pro-tobacco messages, the majority were cigarette ads (82.5%) followed by e-cigarette ads (11.3 %) seen outside (32.5%) or inside (32.5%) a convenience store or gas station. Half of the ads included the price (51.2%) and three-fourths (75.0%) contained an anti-tobacco warning. Only 7.5% contained humans in the ad. The most prevalent theme for the ads was conventional (e.g., good price, high quality; 51.2%) followed by lifestyle factors (e.g., glamor, living boldly; 22.5%), and comparative reasons for use (e.g., harm reduction; 16.3%). Of the anti-tobacco messages, 54.9% were sponsored by public health campaigns or were signage outlawing smoking in a public area (41.2%) and seen in a place of business (31.4%) or on TV (21.6%). Of these, the most prominent focus was on the health harms of smoking (29.4%). **Conclusion:** Low SEP groups in this study encountered more pro-tobacco than anti-tobacco messages at places that were point-of-sale. Advertisers frequently use conventional themes, including price promotions to appeal to this group. However, very few messages contained humans, a tactic known for garnering attention. Future research may consider examining whether anti-tobacco messages at point-of-sale may help combat the advertisements encountered there, especially for price-sensitive, low SEP groups.

FUNDING: Federal; Nonprofit grant funding entity

PH-163

ROLL WITH US INSTAGRAM IMAGES OF BACKWOODS CIGARILLO BLUNTS

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Significance: Blunts are partially or fully hollowed-out large cigars, little cigars, or cigarillos that are refilled with marijuana. Cigarillo brands like Backwoods (Imperial Tobacco Group Brands LLC) have product features that facilitate blunt-making, including a variety of brand-specific flavors that enhance the smoking experience (e.g., honey, dark stout). Backwoods has a growing online presence with a user-friendly website and an active Instagram account with over 30,000 followers. Instagram, one of the most popular platforms among youth, offers a unique opportunity to examine blunt making as Instagram accounts will contain images reflective of organic behavior occurring without the prime of a researcher. The present study examined the extent to which Backwoods-related posts to Instagram showed blunt-making. **Methods:** Inclu-

sion criteria for this study included an Instagram post with the hashtag "#backwoods". Rules were established to content analyze (n = 1,206) posts. Categories included Type of post (i.e., photo or video or both); Blunt-related hashtags (i.e., the corresponding caption to the post contained hashtag(s) like #blunts, #cannabis, #weed that were identified in previous social media research); Rolling (i.e., the post contained an image of an individual(s) rolling a Backwoods cigarillo visibly containing marijuana); Smoking (i.e., the post contained an image of an individual(s) blowing smoke or holding a lit blunt. Similar to previous research using Instagram data, we coded images for Flavor reference, where a code of 1 showed a Backwoods cigarillo pack with a brand-specific flavor (e.g., honey, dark stout, Russian crème) visible in the blunt-related image and a code of 0 indicated that a Backwoods cigarillo pack with a brand-specific flavor was not visible anywhere in the image. **Results:** Among all posts (n = 1,206), 871 (72.2%) were Blunt-related hashtags. A total of 125 (10.4%) images were coded Smoking blunts and 25 (2.1%) were coded Rolling blunts (i.e., Backwoods cigarillo explicitly used to roll blunts. Among blunt images, 434/843 (51.5%) were coded Flavor (i.e., a Backwoods pack with a brand-specific flavor was visible). **Conclusion:** Given that cigarillo product features (e.g., brand name, flavors) facilitate blunt-making, comprehensive cigar regulations that include restrictions on product features are needed by the FDA to curb blunt use. Tobacco control approaches should consider Instagram's influence when designing policies to curb blunt use. Research is needed to examine how youth might be turning to Instagram to learn about blunt making. Additionally, continued monitoring and surveillance of blunt-related posts on Instagram is needed to inform policies that reduce the risk that youth may experiment with blunts.

FUNDING: Federal

PH-164

#IQOSFASHION: CHARACTERIZING HEATED TOBACCO PRODUCT-RELATED MESSAGES ON INSTAGRAM

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Significance: Heated tobacco or "heat-not-burn" (HnB) products have been introduced in the limited number of marketplaces in the U.S. However, due to extensive and growing digital media promotion of these products, it is likely that public knowledge and purchasing opportunities extend far wider than the limited point-of-sale locations. Exposure to tobacco marketing on social media has been linked to tobacco use among adolescents and young adults, however, these messages continue to be under-regulated and target youth. In particular, research on heated tobacco social promotion is sparse. The objective of the present study was to assess the amount and characterize the content of HnB-related messages on Instagram. **Methods.** Hashtag-based rules were used to retrieve Instagram posts from 07/01/2019 to 11/30/2019. Posts were coded for brand references, promotional strategies (e.g., flavor, influencer promotion), and marijuana co-use mentions using a combination of machine learning methods and human coding. Post metadata were analyzed to assess user geolocation and language of the message. **Results.** Keyword filters captured 1988 relevant Instagram posts over the period of data collection. The monthly volume of messages more than doubled between July 2019 and December 2019. Most popular hashtags were IQOS-related, e.g., ##iqos, #iqos3, #heets, #iqosfriends, #iqosteam, #iqoslovers, #iqosstore, #vape, #iqos2, #iqoscase, #iqosclub. Over 25% of messages featured mentions of marijuana. A large proportion of posts included links to online retailers and e-commerce websites and did not feature warning labels or "age gating." Promotional posts featured glamour and fashion appeals, luxury brand mentions, and were often geo-tagged in affluent countries and locations (e.g., Monte Carlo, Dubai), with offers of international shipment/delivery. Posts also featured reduced harm appeals, "taste satisfaction", technology, event promotion, discounts, and flavor appeals. **Conclusion.** Tobacco control prevention initiatives should include efforts to prevent and reduce HnB uptake by new users and youth and should take into account the role of social media as a major marketing platform for these products.

FUNDING: Nonprofit grant funding entity

PH-165

CHARACTERIZING THE ADVERTISING STRATEGIES AND EXPENDITURES OF THE TRADITIONAL AND NOVEL SMOKELESS TOBACCO PRODUCTS PROMOTION

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Objective: Tobacco-free nicotine pouches are an emerging but rapidly growing smokeless tobacco (ST) category in the U.S. These products may be seen as a less harmful



alternative than traditional ST. Major cigarette and tobacco manufacturers introduced these novel products on the market in recent years. Little is known about the promotional strategies and media channels used to advertise this ST category and the extent to which the marketing strategies differ from strategies used to promote other ST products. We aimed to describe the nature, timing of, and expenditures of traditional and novel ST products on print, broadcast and internet media. **Methods:** Advertising expenditures were collected using Kantar Media's "Strategy" tool which provides advertising data including dollars spent promoting specific products across various media channels including print magazines and newspapers, broadcast TV and radio, outdoor posters and billboards, and internet placement. We identified 306 smokeless products within Kantar's database and collected ad expenditures retrospectively for January 2018 through April 2020. Promotional expenditures were aggregated by month, by designated market area (DMA), and by product category: snus, traditional ST, novel ST, and non-nicotine (e.g. herbal chew). **Results:** Kantar data analysis returned 62 products advertised during the period of data collection; with 72 million dollars spent collectively on ST promotion. Across categories, more advertising dollars were spent on traditional ST products (63%) than novel products (25%), snus (12%), or non-nicotine products (less than 1%). However, during a 9-month period from August 2019 to April 2020, novel products received the majority of monthly ad spending. Most ad spending was placed in the national market (\$66.6 million), with Atlanta (\$1.1 million), Houston (\$1 million), and Las Vegas (\$0.8 million) as the top three DMAs for expenditures. **Discussion:** Advertising expenditures for novel tobacco-free nicotine pouches have recently exceeded traditional ST advertising and are being promoted nationally. This analysis provides early surveillance of the introduction of a novel tobacco product to the market. Marketing surveillance, as well as understanding consumer appeal, perceptions and consumption are critical next steps in tracking potential uptake of these new products.

FUNDING: Federal

PH-166

EXPLORING THE IMPACT OF COVID-19 PANDEMIC ON THE AMOUNT AND THEMES OF SMOKELESS TOBACCO-RELATED MESSAGES ON TWITTER

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Significance. The pandemic of COVID-19 affecting the respiratory system in the form of the novel coronavirus has spread significantly in the US since December 2019. The disease has affected people across all socioeconomic demographics and cultures. While COVID-19-related concerns may have resulted in smokers and vapers switching to smokeless tobacco use; some public health researchers have argued that smokeless use and "spitting" are potential risk behaviors for contracting and spreading the disease. Little is known about the amount, sources, and content of this online discussion, or the amount of misinformation associated with it. The objective of the present study was to characterize the content of US smokeless and COVID-19-related messages on Twitter. **Methods.** Keyword rules were used to collect smokeless tobacco-related posts from the Twitter Historical Powertrack from 01/01/2020 to 04/30/2020. Posts were coded for COVID-19 pandemic mentions using a combination of machine learning methods and human coding. Post metadata were analyzed to assess user geographic location, language, and reach of the message. Non-English-language posts and posts geolocated outside of the U.S. were excluded from analyses. **Results.** Keyword filters captured 4,292 relevant tweets. There was a 30-fold increase in the monthly volume of messages from January 2020 to April 2020. COVID-19-related tweets were most frequently geo-located in New York, Texas, California, Florida, and West Virginia states. The most popular hashtags were #covid19, #coronavirus, #snus, #lies, #vaping, #covid-19, #evali. Newspaper articles discussing the effects of nicotine on susceptibility to COVID-19 were the most frequently linked content. Some promotional messages for snus featured mentions of coronavirus. Harm reduction advocacy accounts were the active users posting about COVID-19 and smokeless tobacco. **Conclusion.** Tobacco control interventions should include efforts to reduce and correct unsubstantiated claims regarding smokeless tobacco and nicotine use for COVID-19 prevention and should take into account the role of social media as a major platform for smokeless product marketing and potential misinformation about COVID-19.

FUNDING: Federal

PH-167

SMOKING, QUITTING AND SOCIAL MEDIA- INSIGHTS FROM REDDIT DURING THE COVID-19 PANDEMIC

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Objective: Recent studies have shown that smoking poses an increased risk of complications from COVID-19. The potential danger to smokers due to compromised lung health and immune function may be an incentive to reduce smoking or quit altogether. On the contrary, economic and social impact of the pandemic could spur tobacco use. The primary objective of this study, therefore, is to understand the impact of the pandemic on cigarette smokers and vapers using social media data on *Reddit*. **Methods:** To examine the online discussion content between smokers during the progression of the COVID-19 pandemic, a total of 63,083 posts from smoking and vaping related sub-reddits were analyzed from December 31, 2019 to May 25, 2020. Posts were content analyzed for discussions related to COVID only, quitting only and both after conducting keyword searches. Topic modeling was used to identify latent topics/themes using Latent Dirichlet Allocation (LDA). **Results:** Overall, posts about quitting saw an increase in mid to late March, coinciding with the time of COVID outbreak and lockdown announcements. Among cigarette smokers, the majority of posts discussing COVID are in the context of quitting smoking. The trend among vapers is quite the opposite; a very small portion of the COVID posts on vaping subreddits were about quitting. Topic modeling revealed that COVID-19 related posts centered around four major themes: News and current events, status updates, personal experiences, and vaping product information. **Conclusion:** COVID-19 appears to play dual roles in both motivating quitting behaviors while also exacerbating challenges to quitters. Moreover, though smokers appear aware of their heightened risk of severe complications from COVID-19 infection, vapers display both opposition and indignance with regards to a connection between vaping and COVID-19 complications. Our findings suggest among other things that the concerns and struggles of vapers and smokers in response to COVID-19 are quite different. These differences necessitate different messaging strategies and interventions to inform and persuade both parties to reduce or quit consumption to protect against severe complications from COVID-19.

FUNDING: Federal

PH-168

BEYOND PERCEIVED EFFECTIVENESS: ADDITIONAL MEASURES OF AD EFFECTIVENESS TO CHANGE SMOKING/ VAPING KNOWLEDGE AND INTENTIONS

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Mass media can be an effective tool in reducing or preventing tobacco use. The truth campaign has been proven effective as a tobacco prevention campaign, tailoring messages to youth and young adults age 15-24 years. Robust pre-market testing helps to determine which ads will be delivered to the truth audience through which media (digital versus television). *Perceived effectiveness*, a multi-faceted construct measuring perceptions of how a message is delivered, has traditionally been used to gauge whether an advertisement may change smoking and/or vaping intentions. This study tested the six traditional PE items and other measures that may have a role to play in determining on-air success. Factor analysis revealed 5 multi-item scales: perceived effectiveness (PE), personally relevant, culturally relevant, strength of messaging and negative attributes. "Likeability", "gave me good reasons not to smoke/vape" and "told me something I didn't already know" were measured as single items. Online, forced exposure, surveys were conducted for 13 tobacco prevention advertisements among a sample of 3,900 (300/advertisement) youth and young adults aged 15-24 years. Participants were randomized to view one advertisement and pre-post survey questions assessed 21 items (all 5 pre-market scales) on a 5-point agreement scale. Ads were classified as either high, medium or low performing by pre-market and in market performance. Aggregated results for the 13 advertisements showed that, regardless of level of performance, 3 of the 4 pre-market scales (excluding culturally relevant) plus "likeability", "gave me good reasons..." and "told me something I didn't already know" were correlated with retention of the main fact from each ad and with intentions not to smoke/vape; with more significant correlations in the higher than lower ad performance groups. Results validate the use of the pre-market testing measuring a range of ad characteristics in addition to the traditional measure of perceived effectiveness. Results confirm additional measures of ad performance can complement perceived effectiveness measures to generate ads that successfully prevent tobacco/vape use in young people.

FUNDING: Other



PH-169

CONTROVERSIAL TOPICS ABOUT E-CIGARETTES IN CHINESE NEWSPAPERS FROM 2004-2019

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Significance. Media is the most readily accessible public information source, shaping attitudes and perception of health issues. Therefore, media presentation of controversial issues around e-cigarettes is important. China is the largest producer of e-cigarettes in the world; however, there is little evidence about e-cigarette media communication in China. This study identified the controversial topics and the dominant arguments in Chinese e-cigarette newspaper reports from 2004 to 2019. **Methods.** The Chinese term for “e-cigarettes” was searched in a widely used Chinese news database *Wisenews* from March 6, 2004 (the date of the first e-cigarette news article in China) to July 31, 2019 when this study began. The authors identified twelve pairs of contradictory arguments, based on literature review, initial reading of 200 randomly selected articles (31% of sample, N=639), and iterative rereading, discussion, and revision. For instance, “using e-cigarettes is healthy” and “using e-cigarettes is not healthy” are a pair. Content analysis of the full text of all 639 articles was conducted to code the arguments in twelve controversies appearing across 4 time periods (2004-2006, 2007-2010, 2011-2017, and 2018-2019). **Results.** The controversies included the (relative) healthiness of e-cigarettes, impact of e-cigarette secondhand aerosol, effectiveness of e-cigarettes for smoking cessation, position on e-cigarette policies outside China, and economic aspects of the industry. Overall, the dominant arguments changed across time periods for most controversies. However, the dominant health arguments were consistent: e-cigarettes per se are not healthy, but healthier than traditional cigarettes. A similar number of articles reported each side of the debate on efficacy of e-cigarettes for smoking cessation consistently over time. The argument, “the economic prospect of e-cigarette industry is positive” was consistently dominant over time. **Conclusions.** Emphasis of the relative healthiness of e-cigarettes compared cigarettes may contribute to rising rates of e-cigarette use. China’s status as the world’s e-cigarette factory may have contributed to the consistent optimism about the future of e-cigarette industry in news coverage despite increasing restrictions on e-cigarette use and concerns about safety. Regulations that address economic issues, such as increasing barrier to enter the industry, or increasing e-cigarette sales taxes to reduce consumption, should be considered.

FUNDING: Federal; Academic Institution

PH-170

#DIPPENATION: CHARACTERIZING THE SMOKELESS TOBACCO-RELATED CONTENT ON TWITTER

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Significance. Social media promotion of tobacco products is proliferating, often targets youth and contains misinformation, however, digital marketing strategies remain an understudied and under-regulated domain in tobacco control. In particular, research on smokeless tobacco social promotion is sparse. The objective of the present study is to assess the amount of smokeless-related messages on Twitter; as well as characterize the content and sources of these tweets. **Methods.** Smokeless-related posts were collected using relevant keywords from the Twitter Historical Powertrack from 08/01/16 to 04/30/20. Posts were coded for commercial content and promotional strategies (e.g., flavor appeals, influencer marketing, youth targeting) using a combination of machine learning methods, keyword filters, and human coding. Post metadata were analyzed to assess geolocation and reach of the messages. **Results.** Keyword filters captured 712,269 smokeless-related tweets posted by 437,049 unique users. Of these tweets, 142,141 (32.5%) were identified as commercial. Approximately 15,900 (3.6%) account users posting about smokeless tobacco were commercial and 16,140 (3.7%) users were “social influencers.” Monthly tweet volume ranged from 8,654 to 88,678 tweets. About 35,698 tweets (5%) featured overt flavor mentions. A large proportion of tweets featured links to e-commerce websites (e.g., Ebay.com, Amazon.com). Popular hashtags were #snus, #skool, #copenhagen, #ebay, #hunting, #travel, #health, #maga, #deplorable. Promotional tweets featured new user appeals, e.g., “spit-free,” “easy-to-conceal,” and “sting-free” claims, giveaways, as well as “tobacco-free” nicotine pouch product advertising and reduced-harm appeals to smokers. TotalDipMove and DipLife community/meme accounts were among the most frequently mentioned accounts. **Conclusion.** Tobacco

control prevention initiatives should include efforts to prevent and reduce smokeless uptake by new users, particularly among youth, and should take into account the role of social media as a major smokeless tobacco marketing platform.

FUNDING: Federal

PH-171

MOST TEENS HAVE HEARD ABOUT EVALI AND MOST THOUGHT NICOTINE WAS THE MAIN CULPRIT

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Significance: EVALI (e-cigarette or vaping product associated lung injury) was first reported by physicians in Wisconsin in July 2019. By October 2019, US Centers for Disease Control and Prevention (CDC) reported more than 1,600 EVALI cases in the U.S. By February 2020, 2807 hospitalized cases and 68 deaths were documented. The news coverage for EVALI was extensive, especially after CDC declared it an outbreak. Using TobaccoWatcher, a real-time global tobacco media analysis engine, we found 19,899 news articles between July and December 2019 that discussed EVALI (defined as mentioning “vaping” and “outbreak” or “illness.”) This study examined teens’ knowledge of EVALI by using 2019-2020 California Student Tobacco Survey (CSTS) data. **Methods:** CSTS randomly sampled high school students in California, and more than 145,000 10th and 12th graders in California participated in CSTS from October 2019 to March 2020. **Results:** We found that most (74.8%) of high school students in California had heard about EVALI. Those who had ever vaped were more likely to have heard about it than those who had never vaped (76.1% vs. 74.2%). Most of them, 66.6% heard about EVALI from news media directly, followed by from friends/peers (12.9%), parents (12.6%), and teachers (7.9%). When asked what they believed to be the most likely cause of these vaping-related illnesses and deaths, 53.9% chose nicotine, 9.9% chose marijuana, 3.9% chose flavorings used in the vaping devices, and 10.6% opted for something else. The rest, 21.7%, said they did not know. CDC later identified Vitamin E acetate, a cutting agent used in some cannabis vaping liquids (mainly in marijuana products from illegal sources), as the most likely cause for EVALI. A search in TobaccoWatcher, however, found only 1,866 of EVALI news articles mentioned “marijuana” or “cannabis”, just 9.3% of all EVALI news articles. **Conclusion:** It appears that news outlets are successful in reaching youth and raising awareness on the potential danger of vaping. However, most students thought nicotine in e-cigarettes was the main culprit, likely influenced by less-than-accurate news reports. The implications of these results for future use of tobacco and marijuana products among youth will be discussed.

FUNDING: State; Academic Institution

PH-172

IMPACTS OF DISCRETE EMOTIONAL APPEALS WITHIN PICTORIAL TOBACCO CONTROL MESSAGES ON PERCEIVED MESSAGE EFFECTIVENESS AND INTENTION TO QUIT AMONG CHINESE MALE SMOKERS

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Significance: Pictorial tobacco control messages (PTCMs) represent a promising tobacco control measure to encourage quitting in China, such as when implemented as graphic warning labels on cigarette packs or delivered as media campaign messages. PTCMs could potentially employ a variety of emotional appeals to enhance effectiveness; however, little research existed to guide the selection of discrete emotional appeals within PTCMs for Chinese male smokers. To fill this gap, the current study experimentally evaluated the impacts of disgust, fear, anger, contempt, shame, and hope appeals within the largest set of PTCMs (N = 510) tested to date on perceived effectiveness (PE) and intention to quit. **Methods:** An online sample of current adult male smokers from China (N = 2306, mean age = 37 years) each viewed a random selection of six PTCMs. After viewing each PTCM, participants reported emotional responses (disgust, afraid, anger/shame at self, contempt for other smokers, hope) and PE (5-point Likert scale, M = 3.58, SD = 0.73, alpha = 0.82). After all six message exposures, they reported their intention to quit in the next thirty days (4-point Likert scale, M = 3.03, SD = 0.62, alpha = 0.74). For each PTCM, message-level emotional appeal scores were created by averaging emotional reactions across the set of smokers randomized to evaluate that PTCM. A cross-classification random-intercept model was fitted to analyze emotional appeals’ impacts on per-message PE. A linear multiple regression model was used to predict intention to quit from overall PTCM-set emotional appeals exposure averaging emotional



appeal scores across the six PTCMs they saw. Both models controlled for demographic characteristics, party affiliation, stage of change, and nicotine dependence. **Result:** Only anger, shame, and hope appeals significantly increased both per-message PE (betas = 0.02, 0.03, 0.02; ps = .039, .001, .023) and intention to quit post all exposures (betas = 0.11, 0.09, 0.07; ps = .000, .001, .003). In contrast to previous research, fear appeal increased PE (beta = 0.06, p = .000) but did not significantly affect intention to quit. The effects of disgust appeal were non-significant for either outcome. Contempt appeal was counterproductive and reduced PE (beta = -0.02, p = .007). **Conclusion:** Among Chinese male smokers, PTCMs that employed anger, shame, and hope appeals improved quitting outcomes better than disgust, fear, and contempt appeals. These results demonstrated the need to consider cultural differences and select evidence-based emotional appeals when implementing PTCMs in China.

FUNDING: Academic Institution

PH-173

ARE TARGETED COUNTERINDUSTRY TOBACCO ADVERTISEMENTS PERCEIVED AS MORE EFFECTIVE BY VULNERABLE GROUPS THAN NON-TARGETED ADVERTISEMENTS? AN EXPERIMENT WITH BLACK AND LGBTQ YOUNG ADULTS IN THE UNITED STATES

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Significance: Some populations disproportionately suffer from tobacco-related illnesses—in part, because the tobacco industry has strategically targeted these populations. To combat industry targeting, anti-tobacco campaigns (e.g., the *truth* campaign) have used analogous messaging strategies, describing the industry's targeted marketing practices in hopes of reaching these vulnerable populations. We conducted a web-based experiment to examine whether members of two such populations (the Black community and the lesbian, gay, bisexual, transgender, and queer [LGBTQ] community) would be particularly responsive to *truth* counterindustry public service announcements (PSAs) that target their ingroup. **Methods:** We recruited N=1161 young adults (M=24.3, SD=3.8), including n=430 Black participants and n=452 LGBTQ participants. Participants were assigned to one of four between-subject conditions: (1) Black-targeted PSAs, (2) LGBTQ-targeted PSAs, (3) PSAs not targeted toward a specific group (hereafter, "non-targeted"), or (4) control. We analyzed data from the first three conditions, running linear regressions for each population to examine the effects of viewing the targeted ads (vs. non-targeted) on perceived message effectiveness, counterindustry beliefs, and anger toward the industry. **Results:** Among Black participants, Black-targeted PSAs received lower ratings of message effectiveness (b=-.42, p=.030), had no effect on counterindustry beliefs (b=.15, p=.48), but induced more anger (b=.48, p=.008). The LGBTQ-targeted PSAs also induced more anger among Black participants (b=.36, p=.047). Among LGBTQ participants, LGBTQ-targeted PSAs were perceived as marginally more effective (b=.29, p=.082), had no effect on counterindustry beliefs (b=.17, p=.33), but evoked more anger (b=.62, p<.001). Similarly, the Black-targeted PSAs also evoked more anger in this group (b=.73, p<.001). For both groups, beliefs and anger were associated with greater perceptions of message effectiveness (ps<.05). **Conclusion:** Our findings provide little evidence that counterindustry messages targeting vulnerable groups are seen as more effective by the ingroup than non-targeted messages. However, targeted counterindustry appeals may be successful at evoking industry anger regardless of the audience targeted.

FUNDING: Academic Institution

PH-174

A HEART HEALTHY INTERVENTION IMPROVED TOBACCO SCREENING RATES AND CESSATION SUPPORT IN 28 SMALL PRIMARY CARE PRACTICES

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Significance. A few interventions have successfully improved rates for tobacco use screening and cessation support in primary care practices. However, it is unclear if a multi-component intervention focused on cardiovascular disease risk reduction improves practice-level tobacco outcomes—particularly in small practices in rural areas. **Methods.** We examined whether an evidence-based cardiovascular disease risk reduction intervention (Heart Health Now) would improve rates for tobacco cessation screening and counseling in small primary care practices in North Carolina. Heart Health Now was a stepped wedge, stratified, cluster randomized trial for primary care practices that were

staffed by 10 or fewer clinicians and had an Electronic Health Record. The Heart Health Now intervention consisted of education tools, provision of onsite practice facilitation for one year, and utilization of a practice specific cardiovascular population management dashboard that included monthly, measure-specific run charts to help guide quality improvement. Our primary outcomes were practice-level rates of tobacco screening and tobacco cessation support—extracted from practices' Electronic Health Records—and measured at pre-intervention and 6 months post-intervention. **Results.** The 28 practices included in our analyses represented 78,120 patients and 17,687 smokers. Significant change occurred in practices' tobacco screening rates and cessation support rates over time. From pre- to post-intervention, screening rates increased from 82.7% to 96.2% (p<0.001). Similarly, cessation support rates increased from 44.3% to 50.1% (p=0.03). Several practice-level factors were associated with improvement including being in an academic health center or faculty practice, having more clinicians, and having a lower percentage of White patients. **Conclusions.** A multi-component intervention focused on cardiovascular disease risk reduction in multiple small primary care practices successfully improved rates of tobacco screening and cessation support.

FUNDING: Federal

PH-175

IMPLEMENTATION OF AN OUTDOOR SMOKE-FREE POLICY AT SPORTS CLUBS: CRITICAL SITUATIONS AND FACTORS INFLUENCING IMPLEMENTATION

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Significance: Outdoor smoke-free policies (SFPs) at sports clubs have significant potential in reducing adolescent smoking. However, the actual occurrence of such effects may be strongly dependent on how these policies are implemented in practice. The aim of this study is to identify to what extent outdoor SFPs at sports clubs are implemented in practice and which factors contribute to successful implementation. **Methods:** Semi-structured interviews were held with 46 key stakeholders at 8 Dutch sports clubs (i.e., field hockey, soccer, tennis, korfbal) with an outdoor SFP. A thematic approach was used for analysis of the transcripts. **Results:** Overall, the implementation of an outdoor SFP at sports clubs appears to be successful. The SFP is often enforced, smokers react positively when they are approached, the SFP has led to less (visible) smokers at the venue, and a nonsmoking norm is reinforced. On the contrary, three 'critical situations', in which implementation is less than optimal, emerged from the data analysis: 1) when children are not present at the sports club, 2) when alcohol is involved, and 3) when smokers relocate at the entrance of the sports club. In addition, seven factors that contribute to successful implementation were identified and classified into four categories: 1) factors related to individuals (i.e., support, communication towards smokers), 2) factors related to the SFP (i.e., formulation of the policy), 3) factors related to the sports club (i.e., communication of the policy, characteristics of the sports club), and 4) factors related to the community (i.e., change of social norm with regard to smoking, support from local and national organizations). **Conclusions:** Successful implementation of an outdoor SFP at sports clubs is feasible. Support is high and experiences are mainly positive. Nevertheless, some challenges are faced as well, especially with regard to compliance and enforcement. To optimize the effectiveness of the SFP, sports clubs need to pay extra attention to the identified critical situations and to the factors that contribute to successful implementation.

FUNDING: Federal

PH-176

REDUCING SOCIOECONOMIC DISPARITIES IN COMPREHENSIVE SMOKE FREE RULES AMONG HOUSEHOLDS WITH CHILDREN--A PILOT INTERVENTION IMPLEMENTED THROUGH A NATIONAL CANCER PROGRAM

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Significance: Most households with a smoker do not implement comprehensive smoke-free rules (smoke-free homes and cars). Furthermore, secondhand smoke (SHS) exposure remains prevalent among children and low-socioeconomic status (SES) populations, and low-SES populations are less likely to implement comprehensive smoke-free rules. This pilot project aimed to assess implementation feasibility and impact of an intervention designed to increase smoke-free rules among socioeconomically disadvantaged households with children. It was implemented through Minnesota's National



Breast and Cervical Cancer Early Detection Program (NBCCEDP). NBCCEDPs provide cancer prevention services to low-income individuals experiencing health disparities. We successfully utilized and adapted the Smoke-Free Homes Program (SFHP). We developed two recruitment methods and compared their effectiveness: (a) direct mail (DM) and (b) opportunistic referral (OR) by patient navigators in the NBCCEDP call center. Mailers were sent to previous NBCCEDP patients who were smokers and nonsmokers who lived with a smoker. Mailers prompted participants to call the NBCCEDP's toll-free phone number; OR consisted of the NBCCEDP call center receiving calls related to cancer services and opportunistically offering the intervention to eligible participants. Methods: Descriptive statistics were used to assess implementation outcomes and hierarchical logistic regression models (HLM) assessed change in smoke-free rules and SHS exposure over the study period. Results: A total of 64 participants were recruited. Results showed 83% of participants were recruited through DM. OR had a high recruitment rate, but DM recruited more participants with higher retention. Among recruited participants with data (N=47), smoke-free home rules increased by 50.4 percentage points during the study period ($p < .001$). Among recruited participants who had a vehicle (N=38), smoke-free car rules increased by 37.6 percentage points ($p < .05$) and comprehensive smoke-free rules rose 40.9 percentage points ($p < .05$). Home SHS exposure declined, and within-person increase in smoke-free home rules was significantly related to less home SHS exposure ($p < .05$). Conclusion: It is feasible to adapt and implement an evidence-based intervention through a national cancer program, which in turn can successfully increase comprehensive smoke-free rules and reduce SHS exposure among socioeconomically disadvantaged households with children.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PH-177

DISSEMINATION OF CATCH MY BREATH, A MIDDLE SCHOOL E-CIGARETTE PREVENTION PROGRAM

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Objectives. In 2016, the US Surgeon General issued a Call to Action to address adolescent e-cigarette use. School-based interventions are an effective component of comprehensive tobacco control. This study describes the development and dissemination of CATCH My Breath, an e-cigarette prevention program for middle and high school students, using the Diffusion of Innovation Theory. Methods. Starting in 2014, a university and nonprofit collaboration designed, formatively evaluated, pilot tested, and disseminated the CATCH My Breath Program (CMB). The team used Social Cognitive Theory to develop the program and Diffusion of Innovations Theory to disseminate the program. Dissemination strategies were applied beginning in 2016. This paper describes the application of both theories and the resulting reach of CMB. Results. Since dissemination began, CMB has been rapidly adopted, following the typical diffusion normal curve. As of June 2020, approximately 4,000 schools in the United States have adopted the program, 70,000 teachers have taught the program, and 1,400,000 students have been exposed to program materials. Conclusion. The application of Social Cognitive Theory and Diffusion of Innovation Theory resulted in effective prevention results and rapid, widespread adoption of CMB. This level of adoption and implementation represents 25% of the school marketplace. CMB should be considered as the school component of the recommended combustible and e-cigarette prevention and control toolkit, alongside mass media, marketing restrictions, retail access, taxation, flavor ban, and FDA premarket approval. Other public health interventions seeking rapid adoption should consider applying principles of Diffusion of Innovation as a guide for development and dissemination.

FUNDING: Federal; Nonprofit grant funding entity; Other

PH-178

DUKE-UNC TOBACCO TREATMENT SPECIALIST TRAINING PROGRAM PIVOTS SUCCESSFULLY TO INTERACTIVE VIRTUAL TRAINING IN RESPONSE TO COVID-19 PANDEMIC

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Background: Tobacco treatment specialist (TTS) training has historically occurred through in-person, regional programs delivered over 4 to 5 days. Since 2016, the Duke-UNC Tobacco Treatment Specialist Training Program (DUKEUNCTTS), a collaboration of Duke University, University of North Carolina, and the North Carolina Division of Public Health, has offered in-person trainings, serving residents of North Carolina and surrounding states. In response to COVID-19, DUKEUNCTTS successfully launched a virtual TTS training format in June 2020. A primary goal in developing this virtual offering was to translate a highly interactive curriculum to an online format. **Methods:** We describe modifications made to all live course components to be delivered either asynchronously (via prerecorded video modules) or synchronously (via videoconference sessions). We also describe the customized course portal on Duke's online learning management system, with access to videos, assignments for reflection, resources, and forums for discussion among program participants and faculty. We detail our framework of live content, delivered via half-day virtual videoconference sessions using interactive tools such as breakout rooms and polls and spread out over a 2-week period to accommodate adult learners with other work responsibilities. All course components worked together to help students maintain engagement with the TTS curriculum throughout the course. **Results:** The virtual training in June 2020 ultimately reached 109 participants in 16 US states, representing a nearly 50% increase in capacity and broader reach across the country than any previous training. Seventy students were from North Carolina. Responses to the post-course survey indicated that almost 90% of participants agreed or strongly agreed that the technical components of the course were easy to navigate. **Discussion:** While COVID-19 presents significant obstacles to offering a scientifically rigorous and experiential virtual TTS training, strategic planning and collaboration resulted in an ambitious and successful virtual program that appealed to participants across the US. The virtual format was advantageous in reaching a geographically diverse audience across the country by removing the barrier of travel and associated costs.

PH-179

INCREASING THE ACCESSIBILITY OF EVIDENCE-BASED TREATMENT BY INCREASING THE NUMBER OF ACCREDITED TTS TRAINING PROGRAMS

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Significance: Tobacco use is influenced by many biopsychosocial and cultural factors. World-wide, the complexity of providing tobacco use treatment is increasing as novel



tobacco and nicotine products grows rapidly. Most tobacco users want to quit; however, without evidence-based treatment, few quit attempts result in abstinence. The best treatment outcomes occur when highly skilled tobacco treatment practitioners provide evidence-based medications combined with tailored behavioral treatment. Tobacco Treatment Specialists (TTSs) are highly skilled professionals with the competencies needed to provide evidence-based treatment of varying intensities in multiple modalities with different populations. The Council for Tobacco Treatment Training Programs (www.cttp.org) ensures that TTS training programs meet established training standards and supports the development of accredited programs. This study examined the characteristics of TTSs trained in and the growth of Council-accredited programs from 2017-2019. **Methods:** Since 2017, all Council-accredited programs report annually a minimal set of data from trainees including basic demographics, professional discipline, work setting, and reasons for seeking TTS training. Descriptive statistics were conducted on all data reported. **Results:** Trainees (n=5,991) were from North America, Middle East, Europe, Asia, Africa, and Australia and were predominantly White (69.1%); 32.7% had bachelor's, 34.8% master's, and 13% doctoral degrees. Over 50 disciplines were represented. Most worked in hospitals or medical centers (34.4%), academic settings (16.1%), or community health centers (11.4%). Two-thirds (66.2%) had <1 year of tobacco treatment experience. Reasons for attending training were to implement tobacco treatment services (53.5%), gain information (48.8%), and obtain certification (45.7%). From 2017 to 2019, the number of programs reporting data increased from 14 to 20 and the number of trainees increased 20%. With the recent accreditation of two programs in the Middle East, the number of trainees from that area increased from n=50 (4.8% of total) to n=160 (7.3% of total). **Conclusions:** Accredited TTS training programs attract an increasing number of health care providers, many of whom with little previous experience treating tobacco use seeking to develop new tobacco treatment services. Increasing the number of training programs is likely to increase the accessibility of treatment provided by highly skilled tobacco treatment providers.

FUNDING: Unfunded

PH-180

CIGARETTE AND WATERPIPE USE AND CESSATION AMONG UNDER-REACHED ARAB AMERICAN TOBACCO USERS, A COMMUNITY-ENGAGED PILOT STUDY

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Significance Arab American community surveys have shown current adult smoking rates ranging from 39% to 60% (compared to 16% for US adults). Arab Americans are not yet a priority population, and there are very few cessation resources specific to them. To develop a culturally-appropriate intervention, we empaneled a Community Advisory Board (CAB) of leaders from SF Bay Area Arab American communities and assessed tobacco product use and cessation. **Methods** We developed a brief confidential survey to assess tobacco product use and dependence and barriers and supports for quitting with a total of 120 adult Arab American tobacco product users. We began fielding the survey in community settings, but due to COVID-19 we moved the survey online. Respondents were recruited by word-of-mouth via CAB and staff members, and screened for past 6 months use of any tobacco products. **Results** The sample included 32% women. Of respondents, 66% reported current cigarette use and 75% current waterpipe use. For Cigarettes Per Day, 23% reported 21-30, and none more than 30. For Time To First cigarette, 22% reported within 6-30 minutes and 14% reported within 5 minutes of waking. 46% reported being privately insured and 41% being publically insured (MediCAL). Half (55%) reported a healthcare provider ever talked to them about their smoking, and 45% had been offered cessation information by a provider. 61% reported ever trying to quit smoking, most commonly reporting "on my own" (27%) and "other" methods (26%), then "nicotine patch" (10%). 60% reported that some, and 30% that most, of their friends smoked; while 48% reported that some, and 10% that most, family members smoked. 31% reported that people were allowed to smoke inside their home, and 38% said it would be difficult to prevent home smoking. **Conclusion** Although over a quarter of respondents reported moderate to high nicotine dependence, and the majority had considered or tried quitting, few reported use of cessation best practices. Further research into the reasons for this gap may be warranted. Socially normative smoking may represent barriers to cessation for this community; community prevention strategies may support successful quit attempts.

FUNDING: State

PH-181

BUILD SMOKE-FREE - FIRST YEAR RESULTS OF A CONSTRUCTION SITE CESSATION INTERVENTION IN ONTARIO, CANADA

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Significance Smoking rates among construction trades workers is highly prevalent making this an important target population for cessation interventions. Build Smoke-free (BSF) is a tailored cessation intervention that connects construction workers ready to quit smoking with free resources (e.g., quit kits, NRT, quit coaching), information to increase their odds of success, weekly on-site brief cessation counselling and healthy environment conversations, and a 30-day quit contest. Workplace culture is also addressed to support smoke-free environments for all workers. **Methods** In 2019-20, BSF was delivered to construction workers at 6 unique EllisDon sites in Ontario, Canada. Workers were initially engaged through in-person group presentations delivered at break or shift start. Interested participants completed an intake survey (n=239) and a 6-month follow-up survey (n=69; 29% response). Analyses included descriptive statistics and significance tests to assess changes in smoking and quitting behaviour. **Results** Engagement in the BSF intervention has increased respondents' knowledge about ways to quit smoking (85%), and benefits of quitting smoking (78%). Two-thirds (66%) of respondents agreed that BSF had created a work environment that helped them quit or cut back on smoking. Current smoking status significantly decreased from baseline to follow-up (94% vs. 71%; p < .001). Similarly, Heaviness of Smoking Index decreased, where 55% of respondents were moderately or highly addicted at baseline compared to 29% at follow-up (p < .0001). **Conclusion** In its first year, BSF has increased knowledge about quitting smoking and contributed to supportive environments for construction workers interested in quitting. The program has had a significant positive impact on smoking behaviour including reducing and quitting; however, caution should be taken when interpreting the results due to the low 6-month response rate. As the program expands to other jurisdictions across Canada and adapts to COVID-19, further evaluation will be conducted to inform implementation and understand program impacts.

FUNDING: Federal

PH-182

CROWDSOURCING WITH TOBACCO TRACKER TO INCREASE ENGAGEMENT WITH COLLEGE SMOKE AND TOBACCO FREE POLICY

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Significance: Adopting Smoke and Tobacco Free (STF) campus policies is a necessary first step to reduce the burden of tobacco use, exposure, and harmful environmental impact. Engaging the campus community is critical to the success of STF policies, given that most universities rely on social enforcement. This study evaluates changes in tobacco activity reporting and other markers of policy engagement following introduction of a Geographic Information System (GIS)-based tool for reporting tobacco use and related litter at two public California universities in February 2019. **Method:** An electronic survey was completed by current students, faculty, and staff in November and December 2018 (pre-survey; N=5,412) and November 2019 and January 2020 (post-survey; N=4,519). The survey assessed awareness and use of a tobacco reporting tool, readiness to support the campus policy, engagement with the policy, and attitudes and experiences concerning the STF policy. Pre-post changes were assessed using chi-square tests for binary outcomes and t-tests for numeric outcomes. **Results:** Awareness of a tool to report tobacco use or related litter on campus doubled from pre to post assessment (8.0% to 16.9%, p<.0001). Ever use of an online tobacco reporting tool tripled from 1.1% to 3.1% (p<.0001). Readiness to support the campus STF policy increased (p=.0008). Witnessing smoking/vaping on campus (55.1% to 51.7%) and exposure to smoke/vapor on campus (36.3% to 33.7%) significantly decreased (p's<.01). Accurate knowledge of the STF campus policy increased from pre to post assessment (93.0% to 94.3%, p=.01). Preference for a 100% STF campus increased from pre to post assessment (78.1% to 79.9%, p=.03). **Conclusion:** Challenges with STF policy compliance warrant creative solutions. STF campus policy engagement increased following introduction of a new tool for reporting tobacco use and related litter on campus. Future research



should determine how to best utilize information gained from the Tobacco Tracker to improve policy compliance. Examining the impact of actions taken with Tobacco Tracker data is recommended.

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PH-183

CORRELATES OF READINESS TO SUPPORT COLLEGE SMOKE AND TOBACCO FREE POLICY AND ENGAGEMENT

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Significance: Many universities with Smoke and Tobacco Free (STF) policies rely on social enforcement. Identifying demographic, attitudinal, and behavioral characteristics of individuals who are more and less engaged with STF policies can contribute to targeted interventions to improve compliance. **Method:** An electronic survey was completed by current students, faculty, and staff (N=4,519) at two public California universities in November 2019 and January 2020, following introduction of a new tool to report tobacco use and related litter on campus in February 2019. Readiness to support the campus policy was assessed with a 5-item scale based on the Trans-Theoretical Model and policy engagement with a 9-item scale. Survey responses were combined into a single database and multiple regression models adjusting for covariates (including campus) were run predicting readiness to support campus policy and engagement as a function of tool use (ever vs. never). **Results:** Readiness and engagement were higher among those who identified as women compared to other gender identities (p's<.01), Hispanic/Latinx and Asian compared to non-Hispanic whites (p's<.01), and those who reported past month exposure to secondhand smoke/vapor on campus, had a stronger preference for a 100% STF campus policy, had ever reported tobacco on campus, and perceived policy enforcement as more effective (all p's<.0001). Readiness and engagement were lower among current users of other tobacco products (p's<.0001). The strongest correlate of STF engagement was an attitudinal factor: preference for 100% STF campus policy (coeff=1.07), while the strongest correlate of readiness was a behavioral factor: reporting tobacco activity on campus (coeff=1.18). **Conclusion:** Demographic, attitudinal, and behavioral characteristics of individuals who are more engaged and ready to support STF policies were identified. Cultivating advocacy opportunities for individuals with these characteristics in campus programs could promote greater social enforcement of STF policy and social norm change. Greater attention is needed to users of other tobacco products to engage them with the STF policy and increase their readiness.

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PH-184

TOBACCO TRACKER FINDINGS FROM A NEW TOOL FOR COLLEGE SMOKE AND TOBACCO FREE POLICY ENGAGEMENT

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Significance: Crowdsourcing offers a broad, sustainable vehicle to engage a community in addressing global problems including tobacco control. This could be particularly useful in college settings where resources for tobacco surveillance to support Smoke and Tobacco Free (STF) policy are limited. **Method:** Tobacco Tracker, a GIS-based tool for reporting campus tobacco use and related litter, was launched at two public California universities in February 2019. Reports from March 2019 to February 2020 were analyzed using generalized linear mixed models assuming first order auto-regressive correlation from month to month and a negative binomial distribution with log link. Tracker users who provided contact information completed an electronic user experience survey in April 2020 (N=316). **Results:** Tracker reports were proportional to campus size (275 and 888 reports, respectively). Reports followed an academic cycle, with decreasing trends during academic breaks and increasing trends when classes resumed (p=.002). Tobacco use was reported more frequently than tobacco-related litter (p<.0001). Cigarette smoking was typically reported more often than vaping, but reports of vaping increased to the frequency of cigarette smoking in the second 6 months at one university in contrast to the other (p=.0001). Top motivators for using the Tracker included the importance of a clean environment (79%), negative health effects of exposure to smoke or vapor (69%), and support for the campus STF policy (67%). The most common barriers to Tracker use was "forgetting" (51%) and taking too long to access (42%). The leading desired action following a Tracker report was for litter to be cleaned up (78%). There was also interest in consequences for policy violators including community service (45%) and fines (41%). **Conclusion:** Tobacco Tracker provides a way to engage individuals on college campuses with the STF policy. Tobacco Tracker was similarly adopted at both

universities to report tobacco use and litter. While users reported more tobacco use, the environment was a leading motivator for reporting. Refinements are needed to address accessibility and follow-up actions from reporting.

FUNDING: State

PH-185

UTILIZING CULTURALLY ACCEPTED SOCIAL MEDIA TO ENGAGE CHINESE AMERICAN PATIENTS TO STOP SMOKING

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Significance: Smoking prevalence remains high among Chinese American immigrants, particularly in men with limited English proficiency. We piloted the use of WeChat, a culturally accepted and widely used social media platform among Chinese Americans and Chinese globally, to engage Chinese outpatients to promote smoking cessation. **Methods:** We conducted a pilot randomized controlled trial (RCT) with Chinese current smokers identified via electronic health records of a community-based medical center in San Francisco. Eligible participants (self-identified as Chinese, reported smoking cigarettes daily in the past 7 days, ages between 18-70, smartphone users and able to read Chinese) were randomized into intervention (WeChat, n=30) or Control (assessment-only, n=30). WeChat participants received "WeChat-To-Quit" weekly messages for 6 weeks with messages tailored to users' responses on readiness to stop smoking. Assessment surveys were administered via WeChat at baseline, 1 and 3 months after intervention. Using WeChat video group chat, 3 post-RCT focus groups were conducted with 10 participants selected from participants with high and low levels of intervention engagement. **Results:** Participants included 95% male, 48% aged 65+ (range: 33 to 81 years old), 53% had < high school education, and 86% spoke poor or no English. A majority smoked 10+ cigarettes daily (72%) and had no intention to quit within 6 months (70%). Program engagement was high, 74% interacted with at least 1 weekly message, and 50% completed 3 out of 6 weeks of the program. At 3-month, 80% would recommend the program to others. Few (n=1) participants achieved 7-day abstinence, but WeChat Intervention participants reported more 24-hour quit attempts than Control participants (0.5 vs 1.8; p= 0.02). Focus group participants unanimously expressed a strong preference for using WeChat to receive health related messages due to the convenience of this messaging platform. **Conclusions:** Findings showed that the newly developed WeChat-based intervention was able to engage both motivated and unmotivated smokers. Our culturally appropriate social media intervention has high acceptance and promises in motivating smokers to make quit attempts, which may ultimately promote smoking cessation. Findings provide preliminary evidence for building a culturally appropriate and scalable health systems intervention to address tobacco-related disparities in vulnerable Chinese American immigrants.

FUNDING: State

PH-186

USING CESSATION NAVIGATORS TO REDUCE CIGARETTE SMOKING AMONG RESIDENTS IN MULT-UNIT HOUSING COMMUNITIES, PILOT STUDY IN HEALTH EQUITY AND ACCESS TO CARE

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Smoking prevalence remains disproportionately higher among certain U.S. populations, including residents of government-subsidized multi-unit housing (MUH). A Denver-area housing agency introduced an on-site smoking cessation intervention for adult residents of five MUH campuses, of whom 24.5% (205/835) were smokers. The intervention included cessation coaching and facilitated access to community cessation services, including free nicotine replacement therapy. We evaluated the project, focusing on cessation outcomes and qualitative factors affecting program implementation. **Methods:** We collected data on program effort measures including reach, engagement, and retention; program utilization; and participants' demographic characteristics at enrollment. Specific outcomes of interest were 7-day and 30-day self-reported point-abstinence at follow-up (mean follow-up: 12months; range 6-15 months). Semi-structured interviews were conducted with CN-MUH program staff to capture critical data elements from program development and implementation. Interviews were analyzed to identify challenges, barriers, and successes. **Results:** Most residents were nonwhite (74%), transitioning from homelessness or having unstable employment, and reporting persistent mental illness and/or substance use disorders or physical disabilities. Cessation coaches documented contact with 50% of resident smokers, and 70% of contacts resulted in active



enrollment in CN-MUH. 73 residents participated in at least one cessation coaching session after enrollment. Self-reported smoking abstinence rates at follow-up were 35% 7-day abstinence and 26% 30-day abstinence; these rates compare favorably with other evidence-based cessation programs. Three critical factors contributed to successful program implementation: 1) clear understanding of roles and responsibilities among health and housing partners; 2) experiential knowledge of the target community; and 3) organizational capacity and flexibility.

FUNDING: State

PH-187

CHANGES IN YOUTH VAPING BEHAVIOUR AND MOTIVATION TO QUIT VAPING DUE TO COVID-19: RESULTS OF A QUALITATIVE STUDY

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Significance: Experts in tobacco control and news reports have highlighted the possibility that COVID-19 may lead to changes in vaping behaviour. However, to our knowledge, no studies on youth vaping during COVID-19 have been published. We conducted a diary study to understand how COVID-19 has affected vaping behaviours and motivation to quit vaping among youth. **Methods:** We conducted a two-week diary study from May 28 to June 11, 2020. Eligible participants were 16-18 years of age, lived in Canada, reported past or current regular vaping of nicotine e-cigarettes, and expressed interest in vaping cessation. A five-step constant comparative analysis approach was implemented. **Results:** 22 participants completed the diary study. Participant responses were mixed: 6 vaped the same, 6 vaped less, 4 vaped more, 4 stopped vaping, and 2 decided to stop vaping. Various reasons were reported for changes in vaping behaviour. **Conclusions:** The COVID-19 pandemic was associated with changes in vaping behaviour and attitudes, access to vaping products, and motivation to quit vaping among youth ages 16-18.

FUNDING: Federal

PH-188

UNDERSTANDING FINANCIAL INCENTIVES FOR TOBACCO CESSATION - A HEALTH CARE PERSPECTIVE

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Significance: Literature demonstrates positive cessation outcomes when financial incentives are provided to patients who verifiably quit. Unlike many treatment options, financial incentive interventions appeal to smokers and vulnerable populations participate at high rates. Previous findings have demonstrated tobacco user perspectives and support for these programs, but attitudes and perspectives of healthcare workers need to be examined and insights incorporated into design for incentive program success. **Methods:** Semi-structured qualitative interviews (N=57) took place within a Midwest health system. Professionals were provided with a sample scheme that would pay patients up to \$500 over a 6-month period. Additionally, a quantitative survey was given to physicians (N=77) and nurses (N=100) to assess current tobacco cessation practices and incentive program support. **Results:** The majority interviewed supported the concept of financial incentive programs. Reservations included the idea that "people should not be paid for something they should do regardless." Participants believed offering an incentive would increase patients' initial interest but stated concern about long-term quit success. Patient demographics and size of incentive were perceived as determinants of success. Verification of nicotine-free status and program staffing were the most significant considerations participants expressed. Participants emphasized testing accessibility and provided suggestions of telehealth or mobile testing to reach a wide range of patients. Additional considerations included policies regarding patient recruitment, eligibility, amount of incentive, and burden of cost to system or patient. Quantitative data reflected nurses were slightly more likely than physicians to find financial incentive programs important (54.6%, 50.7%, p=.06), feasible (40.9%, 34.3%, p=.6), although the differences were not significant. Nurses and physicians saw incentives as equally effective (54.2%, 55.4%, p=.8). **Conclusion:** Support for financial incentive programs was considerable amongst healthcare staff. Several aspects should be considered in the design to successfully administer a program.

FUNDING: Federal

PH-189

PREDICTORS OF ELIGIBILITY FOR ENROLLMENT IN SMOKING CESSATION STUDIES AMONG HOMELESS POPULATIONS

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Introduction The prevalence of tobacco use among homeless populations is very high mainly due to factors such as high rates of substance use, mental illness, and social chaos which are common among the homeless. Although studies show that homeless individuals are interested in quitting smoking, they are usually excluded from cessation programs. Our goal was to assess predictors of eligibility to enroll in cessation programs for the homeless. **Methods** Ethical approval was obtained from the University of Minnesota IRB for the Power To Quit II (PTQII) study. PTQII was a community-based study aimed at enhancing smoking cessation among the homeless in the Minneapolis area. Participants were 18 years or older, and those screened more than once were excluded in this analysis. An eligibility survey was administered by study staff between 2014 and 2018. Descriptive statistics were calculated followed by fitting logistic regression models with eligibility to enroll as the dependent variable. **Results** Participants were 29.2% (n=426) female, and 70.8% (n=1,034) male. 32.2% of females, and 40.6% of males were eligible to enroll in the study. Age range was 18 to 77 with mean age of 44.8 years. Among those with 10 or fewer cpd, 39.8% were eligible, and 37.7% of those with more than 10 cpd were eligible. Of those who smoked every day, 40% were eligible compared to 25% of those who smoked only some days. Among participants eligible for housing assistance, 40.6% were eligible to enroll compared to 1.2% among those not eligible for housing. Males were more likely to be eligible compared to females (OR=1.47; p=0.016). Eligibility for housing was predictive of eligibility to enroll in cessation programs (OR=15.56; p=0.010). Those with a 5 ppm or higher carbon monoxide reading were more likely to be eligible (OR=1.89; p=0.013). Alcohol audit scores between 5 and 26 were predictive of eligibility compared to scores under 5 (OR=11.08; p=0.000). **Conclusion** A small portion of homeless individuals are eligible to enroll in the much needed smoking cessation programs. Males and those eligible for housing assistance are more likely to be eligible to enroll in cessation programs.

FUNDING: Unfunded; Federal

PH-190

A BRIEF TOBACCO INDUSTRY DENORMALISATION INTERVENTION AMONG HONG KONG PRIMARY SCHOOL STUDENTS

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Background Tobacco industry denormalisation (TID), aiming to reveal the deceptive and manipulative marketing strategies of the tobacco industry, is underused outside of the United States. We evaluated the effects of a brief TID intervention on Hong Kong primary students' attitudes towards the tobacco industry and intention to smoke. **Methods** The brief intervention was conducted in Primary (Grade) 4-6 students from 4 randomly selected schools during 1 classroom session in 2019. Intervention (TID) and control worksheets (on tobacco control policies in Hong Kong) were randomly distributed to students. Each worksheet had 4 pages including the pre-test, intervention (a game matching pictures and text on TID/tobacco control policies) and post-test. Logistic regression was used to evaluate the effectiveness of the TID intervention. **Results** Completed worksheets were collected from 1059 students (53.1% boys, 66.6% 10-11 years old) with a response rate of 93.6%. The TID (n=536) and control (n=523) groups had similar background characteristics. The TID intervention greatly increased students' negative attitudes towards the tobacco industry (strongly agree or agree) compared with the control group: "Tobacco companies use many tactics to resist tobacco control regulations" (49.0% vs 33.2%, adjusted odds ratio 1.94, 95% confidence interval 1.51-2.50), "Tobacco companies do everything possible to make young people smoke" (55.6% vs 25.4%; 3.67, 2.82-4.77), "Tobacco companies deceived the public for commercial gain" (59.4% vs 36.3%; 2.57, 2.00-3.30) (Ps<0.001). However, no significant effects were observed on students' intentions to use cigarettes or e-cigarettes. **Conclusions** The brief TID intervention significantly increased primary school students' negative attitudes towards the tobacco industry. This simple and low cost intervention has great potential to be implemented in primary schools more widely. Future intervention should evaluate the long-term effects.

FUNDING: Nonprofit grant funding entity

**PH-191****MEDIUM-LONG TIME STORAGE CONDITION OF CAMBRIDGE FILTER PADS CFPs FOR NICOTINE DOSIMETRY**

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Significance: The number of studies comparing cigarettes and electronic nicotine delivery products ENDS is rapidly growing and therefore, in order to establish the real impact on human health, it is necessary to establish a storage protocol for Cambridge Filter Pads CFPs containing nicotine. The aim of the present study was to assess the medium-long time storage condition of CFPs for nicotine dosimetry. **Methods:** Smoke/vapor was generated by a reference tobacco cigarette 1R6F and Electronic Nicotine Delivery Systems ENDS with different exposure regimes - ISO, HCl and CRM81 - and collected in CFPs. Data about nicotine was normalized by Total Particular Matter. One sample t-test and Kruskal-Wallis test were performed to assess statistical differences between CFPs analyzed at time zero - control group - and the others stored under different conditions as solvent, room temperature, -20 °C and -80 °C, and analyzed after 30 days. **Results:** Using ISO regimen, we observed a significant difference of mean value in CFP group stored at room temperature and at temperature -20°C with $p < 0.05$. Moreover, a significant difference of variance in CFP group stored at room temperature was also showed. For Vype ePen, a significant difference with $p < 0.05$ was showed for the mean value of the CFPs group stored in solvent, higher than the mean value of CFPs of the control group. **Conclusions:** In conclusion, our study showed that different exposure regimens and different products can affect the stability of nicotine in CFPs and storage of samples at -80 °C prevent loss of nicotine. These conditions may represent the gold standard in order to ensure proper harmonization of exposure tests.

FUNDING: Nonprofit grant funding entity

PH-192**ADOLESCENTS' BELIEFS, ATTITUDES, AND SOCIAL NORMS TOWARDS SMOKING AND SPORTS**

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Background: Sports participation has shown to be protective in preventing adolescent smoking. However, in-depth knowledge about adolescents' beliefs, attitudes and social norms towards smoking and sports, and whether these are influenced by the implementation of an outdoor SFP is still missing. This study investigates the beliefs, attitudes, and social norms of adolescents towards smoking and sports, and whether these differ between adolescents at sports clubs with vs. without an outdoor SFP. **Methods:** Focus group interviews (n=27) were conducted with 174 adolescents at 16 sports clubs in the Netherlands. Soccer, tennis, field hockey and korfbal clubs were included. The focus group discussions were transcribed verbatim and analyzed thematically using MAXQDA. **Results:** Adolescents hold mainly negative beliefs, attitudes, and social norms towards smoking and sports. According to them, 1) smoking has a negative effect on health and sports performance, 2) sports and smoking do not fit together, 3) sports clubs are places where smoking does not fit, and 4) sports clubs are not associated with smoking. Furthermore, beliefs, attitudes, and social norms do not differ between adolescents at sports clubs with vs. without an outdoor SFP. Nonetheless, argumentation was stronger and more consistent among adolescents at sports clubs with an outdoor SFP, than among adolescents at sports clubs without an outdoor SFP. **Conclusion:** The finding that adolescents hold negative beliefs, attitudes, and social norms towards smoking and sports, points to the importance and potential of sports in the prevention of adolescent smoking. Sports might be used in anti-smoking communication and applied in settings where smoking is still prevalent.

FUNDING: Federal

PH-193**ADVICE TO QUIT AND CESSATION PATTERNS BY RACE ETHNICITY AMONG US ADULT SMOKERS RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVE 4 (2016-2018)**

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Background: Studies have shown the disparities in cessation advice and patterns by race/ethnicity in the United States. For example, compared to Non-Hispanic White (NH White), Hispanic and African American adult smokers are less likely to be advised to quit by health professionals and use tobacco treatment, yet more likely to attempt to quit smoking. As these studies used national datasets from 2015, changes over time may have occurred, especially with increased use of e-cigarettes as a smoking cessation aid. **Methods:** We used data from Wave 4 (2016-2018) of the Population Assessment of Tobacco and Health (PATH) Study. The study sample included adults (ages over 18) who are current cigarette smokers (n=9,865) and a subset of those who attempted to quit in the past 12 months (n=5,472). We conducted logistic regression models to examine the association between race/ethnicity and receiving quit advice, quit attempts, use of any tobacco treatment, and other cessation methods (incl. e-cigarettes and unassisted), controlling for other sociodemographic factors and health conditions. **Results:** Compared to NH White, Hispanic were less likely to receive quit advice (aOR [95% CI]=0.66 [0.52, 0.85]), but more likely to make quit attempts (aOR [95% CI]=1.49 [1.25, 1.78]). However, they were less likely to use any evidence-based treatment (aOR [95% CI]=0.70 [0.51, 0.97]), including NRT (aOR [95% CI]=0.59 [0.38, 0.90]) and prescribed medications (aOR [95% CI]=0.53 [0.30, 0.94]). Non-Hispanic Black (vs. NH White) were more likely to attempt to quit (aOR [95% CI]=1.72 [1.49, 1.98]) and use behavioral treatment (e.g., counseling) (aOR [95% CI]=1.65 [1.08, 2.52]). Both groups were less likely to use e-cigarettes to quit smoking than Whites (aOR [95% CI]=0.46 [0.31, 0.69]); 0.57 [0.38, 0.86], respectively), yet more likely to use unassisted methods (aOR [95% CI]=1.63 [1.22, 2.17]; 1.41 [1.13, 1.76], respectively). **Conclusion:** Hispanic and NH Black (vs. NH White) were less likely to use proven tobacco treatments, even though they were more likely to attempt to quit. Efforts to eliminate disparities must include increasing access to use of proven cessation therapies. **Funding:** This study is funded in part by P20GM130414, a NIH funded Center of Biomedical Research Excellence (COBRE)

FUNDING: Unfunded; Federal

PH-194**PREDICTORS OF NICOTINE DEPENDENCE AMONG ADOLESCENT WATERPIPE AND CIGARETTE SMOKERS**

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Introduction Identifying the factors associated with nicotine dependence (ND) is essential to prevent initiation and continued use, and to promote cessation among youth. Yet, little is known regarding factors associated with ND among adolescents, especially those using emerging tobacco products such as the waterpipe (WP). This study aims to document the predictors of initial and full ND symptoms among adolescent WP and cigarette smokers. **Methods** A 6-year longitudinal study was conducted among 8th and 9th graders from 38 schools in Lebanon. The analysis sample included current (past 30 days) exclusive-WP (n=228) and exclusive-cigarette smokers (n=139). Weighted Cox proportional hazards models were used to characterize predictors of initial ND symptoms and full ND syndrome. **Results** Predictors of experiencing initial ND symptoms among WP smokers included low maternal educational level, having a sibling who smoked WP, low physical activity, high BMI, smoking initiation at a younger age. For cigarette smokers these were being male, younger, having lower BMI, having a sibling who smoked cigarettes, living in a crowded household, and smoking daily were at greater risk of experiencing initial ND symptoms. Among WP smokers, predictors of developing full ND syndrome include being younger, believing that WP smokers have more friends, initiating smoking at a younger age, and reporting a higher number of WPs smoked in the past-month. For cigarette smokers, predictors of full ND syndrome were



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being younger, initiating smoking at a younger age, and a higher number of cigarettes smoked daily. **Conclusions** Smoking cessation and prevention interventions targeting youth should address modifiable, and tobacco use specific factors that influence the development of ND among young WP and cigarette smokers. They also need to start at a younger age to target those most vulnerable to developing life-long addiction to tobacco products.

FUNDING: Federal

PH-195

EFFECTS OF VAPING AND SMOKING DURING PREGNANCY ON FETAL GROWTH RESTRICTION

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Significance: Variable patterns of use of electronic (EC, vaping) and combustible cigarettes (CC, smoking) occur around pregnancy, however the effect of these patterns on infant health are poorly characterized. We aimed to assess the association between the dynamic changes of vaping, smoking, and non-use before and during pregnancy and risk of small-for-gestational-age (SGA) birth. **Methods:** Data from the 2016-2017 (Phase 8) Pregnancy Risk Assessment Monitoring System (PRAMS, N=74,543 mothers) was analyzed. Using birth certificates, fetal growth restriction was defined as birth weight below the 10th percentile or small-for-gestational-age (SGA). Mothers were grouped based on their self-reported vaping and smoking status 3 months before pregnancy as either exclusive EC users, exclusive CC smokers, dual users, or non-users. We used log-binomial regression models to estimate relative risks (RR) and 95% confidence intervals (CI) for associations between changes in EC and CC use around pregnancy and risk of SGA, adjusting for socio-demographic and pregnancy characteristics. **Results:** The risk of SGA was 8.8% among non-users (reference group for further comparisons). Among exclusive EC users 3 months before pregnancy, continuous vaping was associated with a high risk of SGA (18.1%; adjusted RR, 1.6 [95% CI, 1.5-1.7]), whereas quitting vaping by the last 3 months of pregnancy normalized infants' risk of SGA (7.3%; 0.8 [0.8-0.9]). Among dual users, quitting vaping only by the last 3 months of pregnancy had less effect on risk of SGA than quitting smoking only (19.3%; 2.2 [2.1-2.2] and 13.9%; 1.4 [1.3-1.5], respectively). However, quitting both had the largest effect on risk of SGA (10.3%; 1.1 [1.1-1.2]). Among exclusive CC smokers, completely switching to exclusive EC use by the last 3 months of pregnancy normalized the risk for SGA (7.9%; 0.9 [0.7-1.0]). **Conclusion:** Exclusive EC users who quit vaping by late pregnancy can normalize the risk of SGA. Among dual users, quitting smoking only has a more significant effect than quitting vaping only, although quitting both has the greatest impact. Among exclusive CC users, completely switching to EC can normalize the risk of SGA.

FUNDING: Federal

PH-196

DUAL USE OF ELECTRONIC CIGARETTES AND COMBUSTIBLE TOBACCO IS ASSOCIATED WITH SUBSEQUENT DEVELOPMENT OF RESPIRATORY SYMPTOMS

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Significance Most e-cigarette (e-cig) users also smoke tobacco. The health risks, such as new onset respiratory symptoms, of dual product use relative to single product use are uncertain and may be best defined by longitudinal data. **Methods** We used data from the Population Assessment of Tobacco and Health (PATH) Study, a nationally representative longitudinal survey of the US noninstitutionalized population, to evaluate the association between e-cig and/or combustible tobacco use and subsequent development of respiratory symptoms. The population of interest were participants aged ≥ 12 years who, at PATH Wave 3 (2015-16), reported no past 12-month respiratory symptoms, which we defined as self-report of wheezing or whistling in the chest or a dry cough at night not associated with a cold or chest infection. We categorized participants by self-reported e-cig use and tobacco smoking at Wave 3: non-users, current exclusive e-cig users, current exclusive tobacco smokers, or current dual users. The outcome was new onset respiratory symptoms, defined as self-report at Wave 4 (2016-17) of past 12-month respiratory symptoms. We performed multivariable logistic regression, adjusting for age, sex, race, and ethnicity and accounting for the complex sampling design. **Results** Of the 24,269 participants who did not report respiratory symptoms at Wave 3, 81.6% were non-users, 1.4% were exclusive e-cig users, 14.3% were

exclusive tobacco smokers, and 2.7% were dual users. At Wave 4, dual users had a significantly higher odds of new onset respiratory symptoms compared with non-users (19.8% vs 10.7%, adjusted odds ratio (AOR) 2.22, 95% CI 1.79-2.75), exclusive e-cig users (12.0%, AOR 1.90, 95% CI 1.23-2.93), and exclusive tobacco smokers (17.1%, AOR 1.24, 95% CI 1.00-1.55). Results were similar when we included chronic respiratory disease (asthma, COPD, chronic bronchitis, or emphysema) in the regression. **Conclusion** Dual use of e-cigs and combustible tobacco is associated with higher odds of subsequent new onset respiratory symptoms compared with no use or use of either product alone. Those who use e-cigs as a means to stop smoking tobacco should be cautioned against dual use.

FUNDING: Federal

PH-197

U.S. REPRESENTATIVE EXAMINATION OF RACIAL/ETHNIC GROUP DISPARITIES IN SMOKING BEHAVIORS AND CESSATION-RELATED FACTORS

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Background: Racial/ethnic group disparities in smoking and success with quitting exist. We compared racial/ethnic group differences in lifetime quitting of smoking and factors that may influence cessation. **Methods:** Wave 4 (2016-2017) of the adult Population Assessment of Tobacco and Health Study was used to examine prevalences of ever smokers who are now former smokers (lifetime quitters) and the use of the following cessation methods among smokers with a past year quit attempt: medications, counseling/self-help materials, social support, use of other tobacco products to quit, and home smoking ban. Mental health factors (past-month sadness, anxiety, sleep difficulties) that may influence quitting were also examined. Prevalences among American Indian/Alaska Natives (AI/ANs; n=997), Blacks (n=5,152), Asians (n=894), and Hispanics (n=6,672) were compared to Whites (n=19,137) using a p<0.05 for significance. **Results:** Lifetime quitting was lower for Blacks (40.0%), AI/ANs (43.3%), and Hispanics (53.2%), and higher for Asians (70.5%) than NH Whites (59.1%). Interest in quitting among smokers did not differ across racial/ethnic groups. Among smokers with a past year quit attempt, adjusted odds (aOR) of using medications or social support did not differ across racial/ethnic groups. Odds of counseling/self-help materials were higher in AI/ANs (aOR:1.77; p=0.0327), Blacks (aOR:1.93; p=0.0007), and Hispanics (aOR:1.55; p=0.0267) than Whites. There were no racial/ethnic group differences in use of other tobacco products to quit (e.g., e-cigarettes), except for Hispanics who had one-half the odds than Whites (aOR:0.50; p=0.0003). Odds of a home smoking ban were lower in Blacks (aOR:0.45; p<0.0001) and higher in Hispanics (aOR:1.53; p<0.0001) than Whites. No differences in odds of sadness were observed. AI/ANs had greater odds of anxiety (aOR: 1.52; p=0.0054) and sleep difficulties (aOR:1.44; p=0.0161) than Whites; while sleep difficulties were lower among Blacks (aOR:0.79; p=0.003) and Hispanics (aOR:0.80; p=0.0139) than Whites. **Conclusion:** Findings underscore the need for additional resources and efforts to increase quitting, particularly among AI/ANs, Blacks and Hispanics.

FUNDING: Federal

PH-198

SERIOUS PSYCHOLOGICAL DISTRESS TRENDS BY CIGARETTE SMOKING STATUS AND SUBSTANCE USE DISORDERS IN THE UNITED STATES: 2008-2018

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Significance: Serious psychological distress (SPD) is more common among adults who smoke cigarettes and who have substance use disorders (SUD), compared to the general population. It is not known how much the prevalence of SPD differs by both smoking and SUD status, which may contribute to a greater disparity for mental health. This study assessed differences in SPD among adults by smoking and SUD status in 2018 and trends in SPD by smoking and SUD status from 2008 to 2018. **Methods:** Data came from annual, cross-sectional, nationally representative samples of the US National



Surveys on Drug Use and Health (individuals age 12+). Past-month SPD prevalences were estimated each year from 2008-2018 for individuals with current daily, current non-daily, former, and never cigarette smoking by SUD status (n=441,286). Logistic regression models examined linear time trends of SPD. Models with year-by-cigarette status assessed differential time trends among smoking statuses for persons with and without SUD. Results: In 2018, SPD was significantly more prevalent for persons with vs. without SUD among those with daily (29.1% vs. 9.0%) and non-daily (23.2% vs. 8.6%) smoking as well as former (19.5% vs. 3.2%) or never (16.4% vs. 4.3%) smoking. After adjusting for demographics, SPD prevalences increased between 2008-2018 for all persons, especially those with SUD and daily (AOR=1.08, 95% CI: 1.06, 1.11) or non-daily (AOR=1.07, 95% CI: 1.05, 1.09) smoking. The increase in SPD over time was more rapid among those with non-daily smoking than daily smoking for persons without SUD, but not those with SUD (p<0.05). Conclusions: Overall, SPD increased from 2008-2018 in the general US population. However, SPD varied significantly by smoking status, with the strongest increases for those with daily or non-daily smoking and SUD, adding further evidence for addressing smoking cessation and SUD together. SPD was more than twice as prevalent among persons with SUD and daily and non-daily smoking compared to persons without SUD. Rapid increases in SPD for those with non-daily smoking may represent an opportunity for targeted outreach that integrates both smoking and psychiatric disorders.

FUNDING: Academic Institution

PH-199

INDIVIDUAL-LEVEL CORRELATES OF E-CIGARETTE INITIATION AMONG CANADIAN ADOLESCENTS IN GRADES 9 AND 10

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Background: The prevalence of e-cigarette use has increased drastically among adolescents in recent years. While there is plenty of literature around cigarette initiation, there is little focusing on the factors associated with the initiation of e-cigarette use. The objective of this study was to identify individual-level factors associated with e-cigarette use initiation among Canadian adolescents. **Methods:** This study used data from Year 6 (2017-18) and Year 7 (2018-19) of the COMPASS Study. Our sample included 11,184 students in grades 9 and 10 who reported never having tried e-cigarettes at baseline. Students reported demographic information, other substance use, school behaviors, physical activity, sedentary behavior, sleep, symptoms of anxiety and depression, and flourishing and emotional regulation scores. Hierarchical GEE models, stratified by gender, examined the association between baseline characteristics and e-cigarette initiation at follow-up. **Results:** 30% of students reported e-cigarette initiation at follow-up. Students in grade 10 and students who did not identify as white were less likely to initiate e-cigarette use. Other substance use, skipping school, and having an English grade below 80% were associated with e-cigarette initiation among both male and female students. The association between e-cigarette initiation and physical activity, sedentary behavior, sleep, and mental health outcomes differed between male and female students. Meeting the physical activity guidelines was associated with e-cigarette initiation among male students (OR 1.28 [95% CI 1.10-1.49]). Meeting the screen time (0.76 [0.62-0.93]) or sleep guidelines (0.88 [0.78-1.00]) were associated with lower odds of e-cigarette initiation and symptoms of depression (1.18 [1.01-1.38]) were associated with increased odds of e-cigarette initiation among female students. **Conclusions:** Given the different individual-level factors associated with initiation among male and female students, public health interventions may need to be targeted. School-based approaches should target multiple health risk behaviors to help prevent youth e-cigarette use.

FUNDING: Federal; State

PH-200

ASSOCIATION OF FLAVORED ELECTRONIC NICOTINE DELIVERY SYSTEM (ENDS) USE WITH SELF-REPORTED CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) - RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVE 4

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SIGNIFICANCE: Flavors other than tobacco have been identified as a major reason for electronic nicotine delivery system (ENDS) initiation in youth and are thought to

contribute to the continued use of ENDS in users of all ages. Our previous research showed a significant association between overall ENDS use and COPD. This study aims to identify the association of ENDS flavor categories with self-reported COPD. **METHODS:** The data analysis included 4,909 adults from Population Assessment of Tobacco and Health (PATH) Wave 4 data who were ever established ENDS users and responded to an item about diagnosis of COPD. Weighted multivariable logistic regression models were used to examine the association between different ENDS flavors and self-reported COPD considering complex sampling design. **RESULTS:** Among 4,909 ever established ENDS users, 418 adults (weighted percentage 9.8%) had self-reported COPD. Self-reported COPD prevalence differed between different ENDS flavor categories, with the highest (weighted percentage 19.9%) occurring among tobacco flavor users. Compared to non-tobacco flavor categories, tobacco flavor category showed significantly higher association with self-reported COPD (aOR = 2.05, 95% CI: 1.20, 3.53), after adjusting for potential confounding variables. No significant associations with self-reported COPD were found for other examined ENDS flavor categories including menthol/mint, fruit, candy/desserts/other sweets, and other flavors, compared to their corresponding non-users. **CONCLUSION:** Tobacco flavored ENDS use was significantly associated with self-reported COPD. Our results provide important evidence for future flavor regulations for ENDS extending beyond flavors thought to be appealing to youth.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PH-201

TRENDS IN OPIOID MISUSE BY CIGARETTE SMOKING STATUS AMONG US ADOLESCENTS RESULTS FROM NATIONAL SURVEY ON DRUG USE AND HEALTH 2015-2018

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Background: There is a growing public health concern over increasing rates in opioid-related emergency department visits and death among adolescents in the United States. Tobacco use in adolescence is associated with an increased risk for opioid misuse. This study aims to investigate associations between tobacco use and opioid misuse based on recent US representative youth data and controlling for other substance use risk factors. **Methods:** We used pooled youth samples from the National Survey on Drug Use and Health (NSDUH) 2015-2018 (N=54,866). We calculated weighted estimates of overall past-year opioid misuse across years and stratified them by current (past-month) cigarette smoking status. We further estimated a multivariable logistic regression model to examine the likelihood of past-year opioid misuse as a function of current cigarette smoking, controlling for survey year, sociodemographics, and use of other tobacco (e.g., cigars, pipe, smokeless) and substances (e.g., alcohol, cannabis, other drugs). **Results:** Current smokers reported significantly higher prevalence of past-year opioid misuse than non-smokers across all years (Smokers: 24% in 2015 to 20% in 2018; Non-smokers: 3.1% in 2015 to 2.3% in 2018). Moreover, while there was a statistically significant reduction in opioid misuse among non-smokers over time (p<.001), the trend among smokers was non-significant (p=.417). In a multivariable logistic regression, past-month smokers (vs. non-smokers) had higher odds of past-year opioid misuse (aOR=2.37; 95% CI=1.88, 2.99). Additional risk factors for past-year opioid misuse were: being non-Hispanic Black (aOR=1.35, 95% CI=1.07, 1.71) or Hispanic (aOR=1.33, 95% CI=1.08, 1.63) (both compared to non-Hispanic White), past-month use of other tobacco (aOR=1.66, 95% CI=1.29, 2.14), alcohol (aOR=2.01, 95% CI=1.64, 2.46), cannabis (aOR=2.17, 95% CI=1.69, 2.78) and other drugs (aOR=26.12, 95% CI=21.90, 31.15). **Conclusion:** This study highlighted the co-use patterns of cigarette and opioid misuse among US adolescents. Tobacco control interventions reducing tobacco use among young people may thus have a downstream effect on opioid misuse.

FUNDING: Unfunded

PH-202

PROPORTIONS AND CORRELATES OF MARIJUANA VAPING AMONG ADULTS CURRENTLY USING ELECTRONIC NICOTINE PRODUCTS

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Introduction: Marijuana vaping has increased among younger populations in tandem with the continued rise in e-product use and medical/recreational marijuana legalization. Although the patterns of tobacco and marijuana co-use are well-documented, less is known about vaping nicotine and marijuana. **Methods:** Data on adult (18+) current electronic nicotine product (e-product) users come from Wave 4 of the Population Assessment of Tobacco and Health (PATH) Study (n=3,858). Current e-product use



was defined as use in the past 30 days. Self-reported frequency of marijuana vaping among e-product users was categorized as never, rarely, sometimes, most of the time, and every time. Proportions of marijuana vaping among e-product users were calculated overall and by sex, age, race/ethnicity, sexual orientation, educational attainment, and family income. Adjusted multinomial logistic regression evaluated associations between sociodemographic characteristics and frequency of marijuana vaping compared to vaping nicotine only. **Results:** About one-third (31.4%) of current e-product users vaped marijuana, with 4.5% vaping marijuana every time they used an e-product. In adjusted models, adults ages 35 and older (v. adults ages 18-24) had lower odds of vaping marijuana most of the time (OR: 0.25, 95% CI: 0.12-0.53) and every time (OR: 0.59, 95% CI: 0.36-0.95), compared to vaping nicotine only. Hispanics (v. non-Hispanic Whites) had greater odds of vaping marijuana every time (OR: 2.72, 95% CI: 1.87-3.97), while sexual minorities (v. heterosexuals) had greater odds of vaping most of the time (OR: 2.04, 95% CI: 1.24-3.37), compared to vaping nicotine only. Patterns of nicotine and marijuana vaping did not significantly differ by educational attainment or family income levels. **Conclusions:** Nearly one-fourth of current e-product users vaped products containing both nicotine and marijuana. Patterns of vaping differed by age, sex, race/ethnicity, and sexual orientation, but not socioeconomic status. Efforts to reduce vaping and its associated health consequences should consider people who vape marijuana exclusively or in addition to nicotine.

FUNDING: Federal

PH-203

WHO'S QUITTING? WHO NEEDS ADDITIONAL SUPPORT? CESSATION DISPARITIES BY RACE, EDUCATION, AND INCOME

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Significance Tobacco use disparities have been well documented, as those who identify as Black and who report lower income and education experience a disproportionate burden of tobacco's harm. Less is known about the quitting behavior of these groups in the current tobacco landscape. This current study investigated this research gap using data from the 2018 Minnesota Adult Tobacco Survey (MATS). Methods MATS is a cross-sectional, random digit-dial telephone survey of adult Minnesotans. MATS (N = 6,055) assessed cessation indicators including quit ratio (former smokers divided by ever smokers), past year quit attempts, quit success (past year former smokers divided by current smokers + past year former smokers), and whether a healthcare provider had advised quitting. Data were weighted to account for sampling and geographic stratification, ensuring statewide representativeness. Regression analyses tested for differences by race (Black vs. White), income (low vs. medium/high), and education (low vs. medium/high). Results Quit ratios were lower for Black respondents (vs. Whites: 38.7% vs. 67.5%) and those with low income (vs. medium/high income: 48.3% vs. 69.5%) and low education (vs. medium/high education: 57.6% vs. 70.2%). Similar results were observed for quit success, with lower prevalence observed for Black respondents (6.5% vs. 11.6%), low income (9.2% vs. 12.3%), and low education (6.5% vs. 15.8%). The same groups were also less likely to report receiving advice to quit smoking (Blacks: 76.9% vs. 84.1%; low income: 76.8% vs. 87.2%; low education: 79.8% vs. 85.7%). Despite these disparities, Black respondents and those with low income and low education were *more* likely to engage in quitting behaviors: made a quit attempt in the past year (Blacks: 64.9% vs. 41.5%; low income: 48.3% vs. 69.5%; low education: 57.6% vs. 70.2%); and made more past year quit attempts (Blacks: 10.9 vs. 1.7; low income: 4.4 vs. 1.8; low education: 2.8 vs. 2.0). Conclusions Large proportions of those who experience a disproportionate burden of tobacco's harm are trying to quit smoking. Additional supports, both those focused on addressing social determinants of health as well as tailored interventions, are needed to foster quitting and reduce tobacco-related disparities.

FUNDING: Federal; State; Nonprofit grant funding entity

PH-205

STATE-SPECIFIC PREVALENCE OF TOBACCO PRODUCT USE AMONG U.S. WOMEN — TOBACCO USE SUPPLEMENT TO THE CURRENT POPULATION SURVEY, 2018-2019

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Significance: Each year, about 202,000 U.S. women die of smoking-related diseases, including pulmonary disease, cardiovascular disease, and multiple cancer types. Characterizing women's tobacco product use behaviors can help inform public health policy, planning, and practice. **Methods:** Data were from the 2018-2019 Tobacco Use Supplement to the Current Population Survey, a cross-sectional survey conducted every 3-4 years of noninstitutionalized adults aged ≥18 years in the 50 U.S. states and DC. Among female self-respondents (N=74,983), state-specific weighted prevalence estimates and 95% confidence intervals (CIs) were generated for current use ("everyday" or "someday") of individual tobacco products (cigarettes, e-cigarettes, cigars, regular pipes, water pipes or hookah, smokeless tobacco), ≥2 products, and any tobacco product. Adjusted prevalence ratios (aPR) for any current tobacco product use accounting for age, race/ethnicity, education, annual household income, and U.S. region were calculated (p<0.05). **Results:** State-specific current use of any tobacco product among women ranged from 6.6% (California) to 23.1% (West Virginia). Current use of ≥2 products ranged from 0.6% (New York) to 3.0% (Oklahoma). Cigarettes were the most commonly used tobacco product in all states and DC (range=5.5%-21.3%), followed by e-cigarettes (range=1.1%-5.1%). The likelihood of any current tobacco product use was higher among women aged 25-34 years (aPR=1.80, 95% CI=1.61-2.01), 35-44 years (aPR=1.93, 95% CI=1.73-2.16) and 45-64 years (aPR=1.80, 95% CI=1.60-2.04) than those aged 18-24 years; non-Hispanic women of other races (aPR=1.26, 95% CI=1.07-1.48) than non-Hispanic whites; women who were never married (aPR=1.46, 95% CI=1.37-1.57) or divorced/widowed/separated (aPR=1.59, 95% CI=1.49-1.69) than those married or living with a partner; and those living in the Midwest (aPR=1.10, 95% CI=1.02-1.19) than those in the Northeast. **Conclusion:** During 2018-2019, tobacco product use among U.S. women varied substantially by state and product type. These findings can help inform comprehensive and evidence-based efforts to reduce the burden of tobacco product use among women.

FUNDING: Federal

PH-206

HARM PERCEPTIONS OF INTERMITTENT TOBACCO PRODUCT USE AMONG U.S. YOUTH, NATIONAL YOUTH TOBACCO SURVEY, 2020

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Significance Youth tobacco product use is unsafe, irrespective of frequency. Symptoms of dependence have been reported among youth who report tobacco product use on 1-2 of the prior 30 days. Misperceptions of the harm of intermittent use may influence tobacco product use patterns. **Methods** Data came from the 2016-2020 National Youth Tobacco Survey, a nationally representative survey of US students in grades 6-12. Harm perceptions of intermittent use of five tobacco products (e-cigarettes; cigarettes; cigars; chewing tobacco, snuff, dip, or snus; hookahs or waterpipe) were assessed by: "How much do you think people harm themselves when they [use product] some days but not every day?" Responses included: "no", "little", "some", and "a lot of" harm. Weighted prevalence estimates and 95% confidence intervals (CI) were calculated overall and by sex, race/ethnicity, school level, current tobacco product use (CTPU), and household member tobacco use (yes/no). Multivariable logistic regression was used to calculate adjusted prevalence ratios (aPR) of harm perceptions (reference= "a lot"), by product. Changes in harm perceptions (2016-2020) were assessed using multivariable regression (p<0.05). **Results** Prevalence of perceiving no/little harm was highest for e-cigarettes (20.1%, 95%CI=18.6%-21.7%), followed by hookahs (17.4%, 16.0%-18.9%), cigars (14.6%, 13.6%-15.7%), smokeless tobacco (13.5%, 12.3%-14.8%), and cigarettes (11.0%, 9.9%-12.2%). Prevalence of perceiving no/little harm from intermittent e-cigarette use significantly declined from 37.5% to 20.1% during 2016-2020; perceiving no/little harm did not significantly change across 2016-2020 for other products. Compared to those who reported "a lot" of harm, CTPU was higher among those reporting "no harm" as follows: hookah (aPR=3.67, 95%CI=2.22-6.08); e-cigarettes (aPR=3.10, 2.44-3.94); cigars (aPR=2.77, 1.81-4.25) and cigarettes (aPR=1.98, 1.29-3.03). **Conclusion** Youth



perceiving that intermittent e-cigarette use did “no harm” decreased during 2016-2020; perceiving “no harm” was associated with higher odds of current tobacco product use. Educating youth about the harms of intermittent tobacco product use is critical.

FUNDING: Federal

PH-207

PATTERNS OF TOBACCO USAGE IN INDIA

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Significance: Tobacco kills nearly 900,000 people each year in India. Prevalence of tobacco use is three times as high in men compared to women, but previous research suggests that a variety of demographic factors influence usage patterns. **Methods:** We performed a quantitative survey among adults between 18 and 69 years of age who are currently using any tobacco product or have quit within the past five years. We assessed demographical and regional differences in tobacco product type and frequency used among the entire population, as well as age of initiation and money spent on tobacco among current users. **Results:** Our study sample comprised 5,360 women and 32,469 men from five regions in India, 86.6% were current users of any tobacco product. In a multinomial regression model, sex, age, education level and geography were the strongest predictors of which type of tobacco product participants currently used. Women of all age groups surveyed were most often exclusive smokeless tobacco users (between 46.4% for the youngest age group and 77.4% for the oldest age group) as were users with low education and rural backgrounds. *Bidi* use was higher in older age groups and among men, while cigarette smoking was more common among the younger generation, the highly educated and the urban population. Usage patterns among participants who had quit were similar. In general, the mean age when men started to use any tobacco was much lower than for women, except for cigarette users where it was nearly the same (19.8, Sd, 4.4 and 20.9, Sd, 4.8, respectively). Users of the younger generation started using tobacco at an earlier age than the older age groups. On average, Indian men spent more money on tobacco products than women. **Conclusions:** Women and men in India have different tobacco product preferences, but there is a generational shift taking place among both genders to more modern and expensive factory-made cigarettes in the younger population. This high heterogeneity should be taken into account in order to tailor specific tobacco use interventions to the needs of different subgroups.

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PH-208

QUITTING MODALITIES, MOTIVATIONS, AND INTENTIONS AMONG FEMALE TOBACCO USERS IN SEVEN COUNTRIES

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Significance Traditional tobacco control has been largely genderblind to date, despite documented sex and gender differences in tobacco use uptake, prevalence, and quitting. Understanding the various modalities that women use and their motivations to quit are critical to developing tailored gender-specific interventions. **Methods** A quantitative survey was administered in Greece (GR), India (IN), Japan (JP), Norway (NO), South Africa (SA), the United Kingdom (UK), and the United States (US). Participants were between ages 18-69, either current users of tobacco/nicotine products, or previous users who had quit within the past five years. Questions assessed quitting motivations, methods used, and potential impacts of price on consumption. **Results** A total of 54267 participants (GR: 1801, IN: 41633, JP: 2227, NO: 1700, SA: 2359, UK: 2250, US: 2309) were sampled, including 11350 (20.9%) women. Between 38% (SA) and 70.9% (JP) of women stated that a price increase of tobacco would affect their consumption behavior, such as reducing their intake. Between 39.1% (SA) and 86.6% (NO) of current women users had made a serious quit attempt in the past, and between 24.2% (GR) and 74.3% (NO) were planning to quit in the future. Personal health was the most reported motivator for quitting in all countries - including women who had tried to, were planning to, and had already quit. The most frequently used quitting modality used in previous attempts and by former users varied across countries, including nicotine replacement therapies (NRTs) in IN, third-party support in NO, and without assistance in GR, JP, SA, UK and the US. **Conclusion** Concern for personal health and other's health were the main quitting motivators for women in all countries surveyed. Despite several available avenues to quit, quitting without assistance was the most used tactic among women participants.

Intercountry differences in quitting modalities used by women, their specific motivations, and cultural differences require further consideration when creating new, more effective, gender-specific cessation or tobacco harm reduction interventions.

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PH-209

EXCLUSIVE AND DUAL MENTHOL AND NON MENTHOL CIGARETTE USE WITH ENDS AMONG US ADULTS, 2013-2019

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Significance: This study examines patterns of menthol/non-menthol (NM) cigarette and Electronic Nicotine Delivery Systems (ENDS) use from 2013-2019 among U.S. adults using three national surveys. **Methods:** Data from three nationally representative surveys: the Population Assessment of Tobacco and Health (PATH) Study Waves 1-4, 2013-2017; the National Health Interview Survey (NHIS) 2015; and the Tobacco Use Supplement to the Current Population Survey (TUS-CPS) 2014-2015_{T1} and 2018-2019_{T2}. We calculated the weighted population prevalence of current exclusive and dual use for each tobacco product (i.e., menthol/NM cigs and ENDS) stratified by age, sex, race/ethnicity, household income, and education in all surveys. **Results:** Exclusive NM cig use (PATH: 9.0%_{w1}, 9.4%_{w4}; NHIS: 8.7%; TUS-CPS: 8.1%_{T1}, 6.9%_{T2}) and dual NM cigs/ENDS use (PATH: 2.4%_{w1}, 1.5%_{w4}; NHIS: 1.5%; TUS-CPS: 1.1%_{T1}, 0.6%_{T2}) were the most common single and dual tobacco use patterns across all surveys. Over time, using TUS-CPS, both exclusive menthol cigarette use (3.9%_{T1} to 3.3%_{T2}) and NM cigarette use (8.1%_{T1} to 6.9%_{T2}) declined. Dual menthol cigarettes/ENDS use also declined (PATH: 1.5%_{w1} to 1.1%_{w4}; TUS-CPS: 0.5%_{T1} to 0.3%_{T2}), as did dual NM cigarettes/ENDS use (PATH: 2.4%_{w1} to 1.5%_{w4}; TUS-CPS 1.1%_{T1} to 0.6%_{T2}). Across surveys, exclusive menthol cigarette use and dual menthol cigarettes/ENDS use were more common among: non-Hispanic Blacks (NHBs) than other racial/ethnic groups; people ages 25-34 years old than people ages 18-24 and 35+; women than men; low-income earners than high-income earners; and respondents with high school education or less compared to those with some college or more education. **Conclusion:** Dual use patterns declined over time. Certain vulnerable population groups including NHBs and low-income earners disproportionately use exclusive menthol cigarettes and dual menthol cigarettes/ENDS. A menthol ban could have a potential pro-equity effect by reducing tobacco use among NHBs, low-income earners, and less-educated individuals.

FUNDING: Federal

PH-210

HEALTHCARE RESOURCES ATTRIBUTABLE TO CHILD TOBACCO SMOKE EXPOSURE

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Significance: Tobacco smoke exposure (TSE) places an economic toll on the U.S. healthcare system. There is a literature gap on pediatric emergency department (PED) and urgent care (UC)-related healthcare costs and utilization specific to tobacco smoke-exposed patients. The objectives were to assess PED visits, UC visits and hospital admissions longitudinally, and baseline visit costs among tobacco smoke-exposed children (TSE group) relative to unexposed children (non-TSE group). **Methods:** We conducted a retrospective study using electronic medical records of 380 children age 0-17 years in the TSE group compared to 1,140 in the non-TSE group. The groups were matched using propensity scores via nearest neighbor search by age, sex, and race/ethnicity. Costs were defined as PED, UC, and hospital admissions charges. Chi-square tests, linear regression, and Poisson regression were conducted. **Results:** Overall, mean child age (standard deviation) was 4.9 (0.1) years, 50.5% were female, and 55.6% were black followed by 35.9% white and 8.5% other race. The majority were non-Hispanic (98.4%) and had public insurance (73.2%). Children had a mean of 0.19 (standard error [SE]=0.01) repeat visits within 30-days, and 0.69 (SE=0.04) PED visits and 0.87 (SE=0.03) UC visits over 12-months following their baseline visit. The proportion of children with ≥1 UC visit was higher among the TSE group (52.4%) than the non-TSE group (45.1%, p=0.01). Children in the TSE group (mean [M]=\$1,136.97, SE=76.44) had higher baseline PED visit costs than the non-TSE group (M=\$1,018.96, SE=125.51, p=0.01) while controlling for child demographics and insurance type. Overall, children had 0.08 (SE=0.01) hospital admissions over 12-months, and the TSE group (M=0.12, SE=0.02) had higher mean admissions than the non-TSE group (M=0.06, SE=0.01, p=0.02). A higher proportion of the TSE group was admitted to the ICU from



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the PED ($p=0.03$). The TSE group was at 1.85 times increased risk of having multiple hospital admissions (95% confidence interval [CI]=1.23,2.79, $p=0.003$) and at 5.64 times increased risk of having PED to ICU admissions (95%CI=1.21,26.19, $p=0.03$) over 12-months than the non-TSE group, while adjusting for child demographics and insurance type. Conclusion: Tobacco smoke-exposed children had higher healthcare utilization over 12-months and higher PED costs at baseline. Parental tobacco cessation and child TSE reduction interventions are needed in the PED, UC, and inpatient hospital settings.

FUNDING: Federal

PH-211

STATE-SPECIFIC PREVALENCE OF CIGARETTE SMOKING, SMOKELESS TOBACCO USE, AND E-CIGARETTE USE AMONG ADULTS - UNITED STATES, 2017-2018

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Significance: Although the national prevalence of current cigarette smoking has declined considerably among U.S. adults over the past several decades, progress has varied across states. Moreover, the tobacco product landscape has evolved to include emerging products such as e-cigarettes. Monitoring recent state-specific variations in different types of tobacco product use can help guide public health policy, planning, and practice. **Methods:** Data from the 2017 and 2018 Behavioral Risk Factor Surveillance System (BRFSS) were used to assess state-specific current use ("some days" or "every day") of cigarettes, smokeless tobacco, and e-cigarettes among adults aged 18 years or older. Weighted prevalence estimates and 95% confidence intervals (CIs) were computed for U.S. states and the District of Columbia (DC). State-specific relative percent changes (RPC) between 2017-2018 were also calculated for each tobacco product. **Results:** In 2018, prevalence of current cigarette smoking ranged from 8.9% (95% CIs: 8.2-9.7) (Utah) to 25.2% (95% CIs: 23.6-26.9) (West Virginia); smokeless tobacco product use ranged from 1.4% (95% CIs: 0.7-2.1) (New Jersey) to 8.8% (95% CIs: 7.7-10.0) (Wyoming); and e-cigarette use ranged from 4.3% (95% CIs: 3.7-4.9) (Maryland) to 7.5% (95% CIs: 6.2-8.7) (Colorado). Between 2017-2018, the RPC for cigarette smoking ranged from a 13.6% decrease in Vermont to a 5.1% increase in Montana, with 12 out of 50 states and DC seeing a RPC increase; the RPC for smokeless tobacco use ranged from a 33.4% decrease in New Jersey to a 51.5% increase in DC, with 20 out of 50 states and DC seeing a RPC increase; and the RPC for e-cigarette use ranged from a 4.4% decrease in Tennessee to a 74.1% increase in Alaska, with 33 out of 36 states seeing a RPC increase. **Conclusions:** Variations in adult tobacco product use were noted by state and product type. Between 2017-2018, the highest state-specific RPC increase in tobacco product use occurred for e-cigarettes, followed by smokeless tobacco, and cigarettes. Comprehensive state-based tobacco prevention and control efforts are warranted to reduce tobacco-related disease and death among U.S. adults.

PH-212

EXPOSURE TO TOBACCO SMOKE AND EARLY CHILDHOOD TEMPERAMENT AMONG US CHILDREN 0-5 YEARS OLD

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Significance: Prenatal tobacco smoke exposure (TSE) is associated with negative neurobehavioral health outcomes, but less is known about this association during the infancy, toddlerhood, and preschool years. We examined the association between TSE and early temperament among children 0-5 years old overall, and within two age-specific groups: 0-2 years and 3-5 years. **Methods:** Data were obtained from the 2017-2018 National Survey of Children's Health including 14,990 children age 0-5 years. TSE was defined as children who did not live with a smoker (no TSE), lived with a smoker who did not smoke inside the home (no home TSE), and lived with a smoker who smoked inside the home (home TSE). We conducted logistic regression while adjusting for child age, sex, race/ethnicity, premature birth, overall health status, parent education level, family structure and poverty level. **Results:** The overall mean child age was 2.7 years (standard deviation=1.6) and 48.7% were female. Over half (52.8%) of children were non-Hispanic white, 11.1% were non-Hispanic black, 12.2% were non-Hispanic other/multiracial, and 23.8% were Hispanic. A total of 41.5% had a low federal poverty level ranging from 0-199%. Concerning TSE, 12.5% lived with a smoker with no home TSE and 1.1% lived with a smoker with home TSE. Children with home TSE were 1.75 times more likely to not always be affectionate and tender (95% confidence interval [CI]=1.18-2.60) than children with no TSE while adjusting for the child covariates. Children with home TSE were also 1.77 times more likely to not always show interest and curiosity

(95%CI=1.13-2.78) or smile and laugh a lot (95%CI=1.13-2.78). Children 0-2 years old with home TSE were 1.97 times more likely (95%CI=1.04-3.75) to not always be affectionate and tender than children 0-2 years old with no TSE. Compared to children 3-5 years old with no TSE, children in this age group who lived with a smoker with no home TSE were more likely to not always bounce back quickly (adjusted odds ratio [aOR]=1.22, 95%CI=1.06-1.41) or smile and laugh a lot (aOR=1.27,95%CI=1.04-1.56). Children 3-5 years old who lived with a smoker with home TSE were more likely to not always be affectionate and tender (aOR=1.67,95%CI=1.01-2.75), show interest and curiosity (aOR=2.30,95%CI=1.43-3.69), or smile and laugh a lot (aOR=2.46,95%CI=1.45-4.18). Conclusion: Tobacco smoke-exposed children were at increased odds of not always demonstrating positive early childhood temperament behaviors, with children 3-5 years old having more pronounced odds.

FUNDING: Federal

PH-213

EXAMINING LONGITUDINAL TRAJECTORIES OF ENDS USE AMONG YOUNG ADULTS FROM 2017-2019

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Significance. Electronic nicotine delivery systems (ENDS) use prevalence increased from 2017-2018 among U.S. young adults, after a decline from 2014-2017. The increase has been attributed to the surge in popularity of vape pods in 2017. Yet, no studies have examined longitudinal trajectories of ENDS use after the 2017 surge. We examined young adults' current/past 30-day ENDS use trajectories from 2017-2019. We hypothesized that the average ENDS use trajectory would increase from 2017-2019. We also examined if social influence and ENDS marketing variables predicted the increasing trajectory. **Method:** Participants were 4,398 young adults, recruited from 24 Texas colleges in 2014 and involved in an online longitudinal study. Data for this study were from the last three yearly waves: spring 2017, 2018, and 2019. In spring 2017, participants were 23.1 years old ($sd=1.82$); 64.3% female; 35.0% non-Hispanic white, 31.2% Hispanic, and 33.9% another race/ethnicity. A linear growth curve model was fit to test the study hypothesis and determine if the time-varying social influence and marketing variables of peer ENDS use, openness to dating an ENDS user, recall of ENDS marketing at the point-of-sale and on the internet predicted the ENDS use trajectory from 2017-2019, adjusting for sociodemographic and other current tobacco use covariates. **Results:** Prevalence of current ENDS use was 9.2%, 12.4%, and 13.9% in 2017, 2018, and 2019, respectively. Analyses confirmed that the ENDS use trajectory increased significantly from 2017-2019 [OR=1.42 (CI=1.28, 1.57)]. Further findings indicated that peer ENDS use [OR=5.02 (CI=3.97, 6.36)], openness to dating an ENDS user [OR=2.19 (CI=2.02, 2.36)], and recall of ENDS marketing at the point-of-sale [OR=1.23 (CI=1.11-1.57)] predicted the increasing trajectory, after controlling for covariates. **Conclusions:** It is common for young adults to mature out of ENDS use, and our prior work shows that ENDS use declined from 2014-2017, but the surge in popularity of vape pods in 2017 appears to have disrupted the decline. Results point to the roles of social influence and marketing variables in increasing ENDS use. Findings are alarming given that lifelong tobacco use is established during young adulthood.

FUNDING: Federal

PH-214

CIGARETTE SMOKING AMONG A HOUSEHOLD SAMPLE OF ALCOHOL DRINKERS IN SOUTH AFRICA: RESULTS FROM SOUTH AFRICAN IAC STUDY

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Significance: This study aimed to determine the prevalence and factors associated with cigarette smoking among alcohol drinkers in South Africa. **Methods:** Data from the 2014 South African arm of the International Alcohol Control study were analyzed. Taylor series linearization approximations were used to account for the complex multi-stage sampling using Stata version 16.0. Chi Square tests, logistic regression analyses were conducted to identify factors associated with cigarette smoking. **Results:** Of 1920 participants (aged 18-65yrs) who had used alcohol in the past six months, 35% ($n=733$) were identified as current smokers. The mean age of these current smokers was 33.5yrs ($SD=11.8$). A greater proportion of current smokers were male as compared to female (42.9% vs



23.0%). About two-thirds, and slightly more than half of current smokers, reported being of Coloured descent (62.8%) and cohabiting (56.1%) respectively. About 41% of smokers reported having secondary school education and being unemployed. Smoking status did not differ by age, socioeconomic status and life satisfaction. A significantly higher proportion of smokers (45.4%) reported having alcohol dependence as compared to those with no dependence (24.0%). In addition, more than half of the current smokers reported that they were completely dissatisfied with their health (54.2%) and 44.2% reported experiencing big changes or stressful events in the last 6 months. Males were about 3.4 times more likely to be current smokers than females (AOR: 3.38; 95% CI: 2.34, 4.89; $p < 0.001$). Coloured were more likely to be current smokers as compared to those who reported their race being White (AOR: 2.48; 95% CI: 1.11, 5.53; $p = 0.029$). Participants who were cohabiting (AOR: 2.17; 95% CI: 1.01, 4.69; $p = 0.048$) had higher odds of being current smokers compared to participants who were married. Participants with secondary education (AOR: 1.78; 95% CI: 1.06, 3.00; $p = 0.032$) were almost 2 times more likely to currently smoke compared to participants with tertiary education. Current smokers were twice as likely (AOR: 2.24; 95% CI: 1.27, 3.98; $p < 0.001$) to report alcohol dependence. **Conclusion:** There is a higher prevalence of cigarette smoking among those who use alcohol or report alcohol dependence than in the general population. The co-use of alcohol and cigarettes is common, but there are limited interventions seeking to address the use of these two substances. Tailored smoking cessation interventions should include the assessment of alcohol dependence among this population.

FUNDING: Academic Institution

PH-215

INTENTION TO QUIT USING TOBACCO AMONG SCHOOL-GOING ADOLESCENTS IN SOUTH AFRICA: RESULTS FROM GLOBAL YOUTH TOBACCO SURVEYS OVER A 12-YEAR PERIOD

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Significance: Quitting tobacco use can be challenging due to nicotine addiction and the dearth of cessation interventions especially in low-resourced settings. We investigated trends of adolescents' intention to quit (ITQ) using tobacco (cigarettes and smokeless tobacco [SLT]) in South Africa (SA) over a 12-year period. **Methods:** Data were from four waves (1999, 2002, 2008 and 2011) of the Global Youth Tobacco Survey (GYTS) conducted in SA among school-going adolescents. The GYTS is a school-based cross-sectional national survey using a standardized methodology. Frequencies, chi square tests and logistic regression analyses were conducted using SPSS version 25. ITQ was calculated on the sample of past 30 days users of cigarettes and smokeless tobacco (snuff and/or chew tobacco). The SA Medical Research Council Research Ethics Committee granted approval for all four GYTS waves while consent/assent was obtained from the National Department of Education, school principals, parents of adolescents and participating adolescents. Overall, participants comprised 51.5% ($n = 16,501$) females and 48.5% ($n = 15,204$) males. **Findings:** The prevalence of cigarette smoking significantly decreased over the 12-year period ($p = .007$) but ITQ smoking did not significantly decrease over same period ($p = .089$). Also, prevalence of using SLT significantly decreased over the 12-year period ($p < .001$) but ITQ using SLT did not significantly decrease over same period ($p = .726$). Multiple logistic regression models to investigate the factors associated with adolescent's ITQ smoking and using SLT showed a significant association between ITQ smoking and: survey year (2008) (AOR=1.69, CI: 1.25-2.28, $p = .001$), age (14yrs: AOR=0.47, CI: 0.32-0.70, $p < .001$; 15yrs: AOR=0.62, CI: 0.46-0.85, $p = .003$), and grade (grade 9) (AOR=1.28, CI: 1.00-1.64, $p = .048$). Only grade (grade 8) was significantly associated with ITQ using SLT (AOR=0.65, CI: 0.44-0.95, $p = .026$). **Conclusion:** There is need for government and all stakeholders to focus on the development of effective and targeted tobacco harms awareness campaigns and cessation interventions to encourage and help more adolescents in SA who use tobacco to explore quitting.

FUNDING: Academic Institution

PH-216

AWARENESS AND USE OF HEATED TOBACCO PRODUCTS AMONG U.S. MIDDLE AND HIGH SCHOOL STUDENTS - NATIONAL YOUTH TOBACCO SURVEY, 2020

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Significance: Heated tobacco products (HTP) heat processed tobacco leaf, making a nicotine-containing aerosol inhaled into the lungs by the user. As of January 8, 2020, the U.S. Food and Drug Administration has authorized IQOS and Eclipse HTPs for sale, and on July 7, 2020, authorized the marketing of IQOS with "reduced exposure" information in the U.S. Little is known about HTP awareness and use in U.S. youth. **Methods:** Data came from the 2020 National Youth Tobacco Survey, an annual, cross-sectional survey of U.S. public and private school students in middle (grades 6-8) and high (grades 9-12) school. Awareness was assessed by, "Before today, have you heard of 'heated tobacco products'?" HTP ever (used even 1 time) and current use (at least 1 time in last 30 days) was also assessed. Weighted prevalence and adjusted prevalence ratios (APR), with 95% confidence intervals (CI), of HTP awareness and use were assessed overall and by the following covariates: sex, school level, race/ethnicity, and current (past-30-day) use of e-cigarettes and other tobacco products. **Results:** In 2020, 19.3% (95% CI: 18.2%-20.5%; 5.29 million) reported HTP awareness, 2.4% (95% CI: 2.0%-2.9%; 0.62 million) reported ever HTP use and 1.4% (95% CI: 1.1%-1.7%; 0.37 million) current use. Students were more likely to be current or ever HTP users if they were current users of e-cigarettes [current HTP APR: 24.7 (95% CI: 13.6-44.8); ever HTP APR: 6.8 (95% CI: 4.7-9.8)] or other tobacco products [current HTP APR: 27.9 (95% CI: 13.7-56.8); ever HTP APR: 11.6 (95% CI: 7.1-18.9)]. Hispanic vs. non-Hispanic White students had increased likelihood of ever [APR: 1.6 (95% CI: 1.1-2.2)] and current HTP use [APR: 1.9 (95% CI: 1.2-2.9)]. Middle vs. high school students had increased likelihood of HTP awareness [APR: 1.3 (95% CI: 1.1-1.5)] and current HTP use [APR: 2.2 (95% CI: 1.5-3.3)]. **Conclusions:** In 2020, about 1 in 5 U.S. students reported HTP awareness, 1 in 40 reported ever HTP use, and 1 in 70 current use. Students who reported current use of e-cigarettes or other tobacco products were more likely to be ever or current HTP users. Monitoring youth HTP awareness and use could inform future public health efforts.

FUNDING: Federal

PH-217

A TEST OF TWO E-CIGARETTE USE FREQUENCY MEASURES USING THE U.S. HEALTH INFORMATION NATIONAL TRENDS SURVEY 5 CYCLE 3 DATA

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Background. Reliable measurement of e-cigarette use is critical to understanding population-level effects, such as product dependence, the utility of e-cigarettes as smoking cessation aids, or e-cigarette uptake and/or transition to conventional cigarettes among never users. One aspect of e-cigarette use is frequency, which is currently assessed using different measures. Participants may understand one measure versus another differently, affecting study estimates, such as use prevalence or associations between e-cigarette use frequency and how harmful individuals perceive the product to be. Inconsistent measurement also makes comparison across studies and with other tobacco products (e.g., conventional cigarettes) difficult. We compare responses to two different e-cigarette use frequency measures (i.e., "Do you now use e-cigarettes every day, some days, or not at all" versus "During the past 30 days, on how many days did you use e-cigarettes?") and their associations with harm perceptions and provide initial recommendations for standard measures to be used across studies and tobacco products to facilitate knowledge synthesis. **Method.** We analyzed data on US adults 18 years or older who had ever used e-cigarettes from the National Cancer Institute's Health Information National Trends Survey 5 Cycle 3 ($N = 712$). Analyses were weighted to account for the study's complex sampling design. We computed frequencies and multinomial logistic regression models (controlling for demographics). **Results.** The measures correlated highly ($r = 0.88$, $p < .001$), but participants varied in how they translated use of e-cigarettes on "some days" ($n = 106$) to number of use days in the past 30 days ($n_{0\text{days}} = 12$; $n_{1\text{-to-2days}} = 27$; $n_{3\text{-to-5days}} = 29$; $n_{6\text{-to-9days}} = 11$; $n_{10\text{-to-19days}} = 19$; $n_{20\text{-to-29days}} = 6$; $n_{\text{all-30days}} = 2$). The two measures showed similar associations with relative harm, such that higher frequency of use was associated with higher odds of perceiving e-cigarettes as less harmful than cigarettes. **Conclusion.** E-cigarette adult users hold different interpretations of the phrase "some days". This study provides initial



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evidence that the past 30-day measure may more accurately assess use frequency for non-daily adult users and could be used across studies and tobacco products to facilitate comparisons and strengthen surveillance of tobacco use patterns.

FUNDING: Unfunded

PH-218

DETERMINANTS OF COTININE-VERIFIED SECONDHAND SMOKE EXPOSURE AMONG NONSMOKING ADOLESCENTS

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Background. Youth are at increased risk of secondhand smoke (SHS) exposure due to the limited control that they have over their environment. Knowledge regarding determinants of SHS exposure among nonsmoking adolescents is limited. Existing studies often do not include measures of potential SHS exposure outside of the home. To address this gap, our study examines social and environmental determinants of SHS exposure within and outside of the home and associations with salivary cotinine concentration among nonsmoking adolescents. **Methods.** Data were obtained from the Adolescents, Place, and Behavior Study, a longitudinal study of adolescents aged 11-17 years. To be included in analyses, adolescents had to have completed baseline survey measures, not reported smoking within the past 30 days, and provided a saliva sample assayed for cotinine. Their parents also had to have completed baseline survey measures (N=125). Logistic regression analyses were conducted to identify social and environmental determinants of SHS exposure. Variables included in analyses were: self-reported average number of days exposed to SHS exposure in public places, cars, and at school; parent tobacco use; peer tobacco use; no smoking policies within the home; number of adults and children residing within the home; race/ethnicity; and, annual household income. **Results.** Of the 125 youth and parent dyads included, the majority was African American (90.3%), had an annual income of >\$50,000 (40.3%), and lived in a single-family home (64.6%). Parent tobacco use (OR = 9.3; 95% CI: 2.2, 40.2) and living in multi-unit housing (OR = 8.2, 95% CI: 1.7, 38.7) were significantly associated with cotinine level, as a binary outcome with a threshold of 1 ng/ml to indicate SHS exposure. Number of adults and children in the home, average number of days of self-reported SHS exposure within public places, in cars, and at school, and smoking policies within the home were not associated with salivary cotinine levels. **Conclusions.** Parent tobacco use and living in multi-unit housing were associated with SHS exposure among nonsmoking adolescents, even after adjusting for other potential social and environmental determinants of SHS exposure. Results emphasize the importance of reducing secondhand smoke exposure among adolescents by altering their exposure to smoke within their social and home environments. These factors should be considered when developing targeted interventions to reduce secondhand smoke exposure.

FUNDING: Nonprofit grant funding entity

PH-219

TRENDS IN SINGLE-, DUAL-, AND POLY-TOBACCO USE AMONG US ADULTS, 2014-2019: RESULTS FROM TWO NATIONALLY REPRESENTATIVE SURVEYS

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Introduction: Increases in the variety of available tobacco products has led to numerous investigations of patterns of dual- and poly-tobacco use. However, trends in patterns of tobacco product use over time are not well documented. **Methods:** Data come from the 2015-2018 National Health Interview Survey (NHIS) and 2014/2015 and 2018/2019 Tobacco Use Supplement to the Current Population Survey (TUS-CPS). We estimated prevalence of four exclusive tobacco use outcomes (i.e., cigarettes, electronic nicotine delivery systems (ENDS), other combustible (i.e., cigars/cigarillos/little filtered cigars and traditional pipe/hookah) (OC), and smokeless) and five dual/poly tobacco use outcomes (cigarettes + ENDS, cigarettes + OC, cigarettes + smokeless, dual/poly without cigarettes, and poly use with cigarettes). For each outcome, generalized linear models with Poisson distributions estimated prevalence ratios (PR) of the change in product use over time, adjusted for age, sex, race/ethnicity, education, and income. **Results:** In TUS-CPS, both exclusive cigarette (PR 0.98, 95% CI 0.96-0.99) and exclusive OC (PR 0.91, 95% CI 0.86-0.96) use decreased. In both surveys, exclusive ENDS use increased (PR 1.36, 95% CI 1.14-1.63 (NHIS); PR 1.93, 95% CI 1.80-2.06 (TUS-CPS)) and cigarettes and ENDS dual use decreased (PR 0.67, 95% CI 0.55-0.80 (NHIS); PR 0.63, 95% CI 0.59-0.68 (TUS-CPS)). Cigarettes and OC dual use increased in NHIS

(PR 1.25, 95% CI 1.03-1.53) but decreased in TUS-CPS (PR 0.88, 95% CI 0.81-0.95). In TUS-CPS, dual/poly use without cigarettes increased (PR 1.21, 95% CI 1.05-1.40) and poly use with cigarettes decreased (PR 0.78, 95% CI 0.67-0.90); statistically significant changes were not observed in NHIS. **Conclusions:** From 2014-2019, exclusive ENDS use increased while cigarettes and ENDS dual use decreased. Results from TUS-CPS show that patterns of dual/poly use with and without cigarettes are changing. Opposite trends in cigarettes and OC dual use between surveys suggest that between-survey analyses are necessary to understand population patterns of tobacco use. Continued monitoring of trends in dual- and poly-tobacco use is needed, including research on its risk factors.

FUNDING: Federal

PH-220

EXPERIENCES OF QUITTING SMOKING AND QUITTING E-CIGARETTE USE ON REDDIT - A TOPIC MODELLING APPROACH

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Background: Novel electronic cigarettes that use pods and nicotine salts (e.g., JUUL) are able to deliver high doses of nicotine. Recently, more reports of people using e-cigarette unable to quit have surfaced and the first interventions solely focused on e-cigarette cessation have been published in the literature. Reddit is a large social media platform that has online communities (subreddits) dedicated to quitting cigarette smoking (e.g., "r/stopsmoking") and quitting e-cigarette use (e.g., "r/QuittingJUUL"). We compared topics discussed on these boards utilizing topic modeling, an unsupervised machine learning approach. **Methods:** We used Reddit text data from 4 subreddits for quitting smoking and quitting e-cigarettes (2 each) from December 2018 to August 2019 archived by Pushshift. The entire database included 15,781 post submissions and 93,062 comments. Latent Dirichlet allocation topic models were estimated to examine topics discussed, with the top 10 most probable words extracted per topic. We examined the top 20 out of 100 topics that showed the largest shift in usage between the quitting smoking and quitting e-cigarette subreddits. **Results:** The topic model clearly reflected the different immediate focus of the quitting smoking and quitting e-cigarette subreddits, evidenced by topics focusing on "smoking", "cigarette", and "packs" in quitting smoking subreddits and topics focusing on "vaping", "juul", and "juice" in quitting e-cigarette subreddits. Interestingly, topics on nicotine and addiction were more common in e-cigarette subreddits, as were topics on withdrawal symptoms (e.g., "withdrawal", "symptom", "mental", "anxious", "depressed", "headache") and health risks or consequences (e.g., "lung", "cancer", "heart", "blood", "risk"). Topics focusing on nicotine replacement therapy and quitting motivation were more common in quitting smoking subreddits. **Conclusions:** The discussion of topics on addiction and withdrawal in quitting e-cigarette subreddits may suggest that people using e-cigarettes experience nicotine dependence and difficulties with quitting use of these devices. Next steps include expert coding of comments for supervised machine learning models and characterizing strategies and barriers of e-cigarette cessation and how they relate to strategies and barriers of cigarette smoking cessation as reported on these subreddits.

FUNDING: Federal

PH-221

WIDESPREAD E-CIGARETTE USE AMONG CIGARETTE SMOKER SAMPLE UNRELATED TO GENDER OR RACE

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Significance: Electronic cigarette ("e-cigarette") use continues to rise among cigarette smokers. Prior research indicates Whites and Males were significantly more likely to use e-cigarettes. Contemporary, regional trends in use patterns can be informative in understanding potential public health impact. **Methods:** Recruitment took place from April, 2019 to March, 2020. Advertisements in Eastern Virginia sought cigarette smokers to participate in a paid research study. Respondents to a screening survey (N=248, M age= 35.4, SD = 9.5, 61% Male, 52% White, 36% Black, 12% Other) on average smoked 16.2 (SD=8.7) cigarettes per day. A majority (50.4%) reported they drink alcohol, over three-quarters (76.2%) reported lifetime marijuana use, and a few (4.0%) reported past-month illegal non-marijuana drug use. The majority (69%) had used an e-cigarette in their lifetime. However, only 14.5% (n=36) had used in the last week. Univariate and multivariate forward stepwise logistic regression models (p<.05) investigated age, gender, race, and substance use as predictors of lifetime, past-month, and past-week use



of e-cigarettes. Results: Lifetime e-cigarette use was quite similar across gender (Male lifetime use: 71% vs. Female: 66%; past-month: 37% vs. 35%; past-week: 22% vs. 21%) and race (White lifetime use: 68% vs. Black: 69% vs. Other: 72%; past-month: 33% vs. 38% vs. 41%; past-week: 20% vs. 24% vs. 23%). In univariate and multivariate models, only age (Odds Ratio: 0.96, 95% Confidence Interval: 0.93-0.98; Adjusted OR: 0.96, 95% CI: 0.93-0.98) and use of alcoholic beverages (OR: 1.96, 1.13-3.39; AOR: 1.87, 1.06-3.31) predicted lifetime use of e-cigarettes. Similarly, only age and marijuana use predicted past-month use of e-cigarettes. No variables examined significantly correlated with past-week use of e-cigarettes. Conclusions: E-cigarette use appears to be more widespread among cigarette smokers in this contemporary sample, lacking previous divergences related to gender and race. Further research is needed to replicate this shift and, if validated with larger samples and in other geographical areas, investigate the potential public health impact.

FUNDING: Federal; State; Academic Institution

PH-223

SAVM: A USER FRIENDLY MODEL OF SMOKING AND VAPING

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Background: Simulation modeling is playing an increasingly important role in tobacco control policy decisions. While many simulation models have been developed that examine the public health impact of nicotine vaping products (NVPs), these models tend to be highly specialized and not accessible to most researchers. The Smoking and Vaping Model (SAVM) has been developed as a cohort-based model using Microsoft Excel with the goal of being readily available, user-friendly, easily adapted, easy to interpret, and transparent. We discuss its application and results for the US. **Methods:** A No-NVP Scenario projects smoking rates in the absence of NVPs using population, deaths rates, expected life years and smoking prevalence data. In the NVP Scenario, the user specifies NVP excess mortality risks relative to smoking, rates of switching from smoking to NVPs, and the rates of initiation into NVP and cigarette use and the rates of cessation from NVPs and smoking. Public health impacts are measured as the difference in smoking-attributable deaths and life-years lost between the No-NVP and NVP Scenarios. **Results:** US SAVM has been validated by age and gender against recent smoking and vaping prevalence from the NHIS. Using evidenced-based NVP parameters, the NVP Scenario projects from 2013-2063 a cumulative total of 2.0 million fewer attributable deaths and 43.0 million fewer LYs than the No-NVP Scenario with NVP excess risks of 5% relative to cigarettes, are reduced to 1.2 million deaths averted and 25.0 million LYs with NVP excess risks of 40%. Sensitivity analysis shows that parameters for NVP excess risks, NVP-related switching and smoking cessation are particularly influential in gauging the public health impact. The model can also be used to examine particular cohorts, and results show larger potential gains for more recent compared to older birth cohorts. **Conclusions:** The SAVM shows potential benefits of NVP use and the sensitivity of those results to key parameters. Policymakers, researchers and other public health stakeholders can use the SAVM to estimate the potential public health impact of NVPs in their countries or regions using their own data sources and studies.

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PH-224

PATTERNS OF SINGLE, DUAL, AND POLYTOBACCO USE AMONG YOUTH: A FIVE-YEAR ANALYSIS

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Significance: The introduction of novel tobacco products, such as electronic cigarettes, has led to an increase in polytobacco (3 or more products) use among youth in the US. Since 2014, research has found that while most adolescents are first introduced to nicotine through e-cigarettes, e-cigarette use can lead to cigarette use later on in life. Limited research exists on the interrelationship between e-cigarettes and other tobacco products. **Methods:** Using the National Youth Tobacco Survey (NYTS) data collected from 2014-2019, we created a 10-category variable of non/single/dual/polytobacco use within the past 30-days. These categories included exclusive product use of cigarettes, e-cigarettes, other combustibles (e.g., hookah or cigars), and smokeless tobacco (e.g., snus or dissolvable tobacco) and the following product combinations: dual use of e-cigarettes plus each of the other groups separately, poly use of e-cigarettes plus two or more of the other groups, and dual or poly use of cigarettes with other combustibles

and/or smokeless tobacco. Logistic regression models examined trends of tobacco product use between users of specific categories vs. non-tobacco users, adjusting for sociodemographic variables. **Results:** While the prevalence of exclusive e-cigarette use increased from 3.2% in 2014 to 12.8% in 2019, the prevalence of polytobacco use with e-cigarettes remained stable at 3.0%. Logistic regression models revealed significant changes in the patterns of use over time. Categories that increased between 2014 and 2019 were: exclusive e-cigarette use (OR=4.31, 95%CI=3.35, 5.54); all of the dual use categories (e.g., e-cigarette and other combustible use (OR=1.54, 95%CI=1.20, 1.99)); and polytobacco use with e-cigarettes (OR=1.06, 95%CI=0.78, 1.43). Alternatively, the categories that decreased over time were exclusive cigarette use (OR=0.35, 95%CI=0.24, 0.53) and dual/polytobacco use without e-cigarette use (OR=0.24, 95%CI=0.17, 0.34). **Conclusion:** It is important to understand patterns of polytobacco use among youth in recent years as cigarette smoking has decreased while e-cigarette use has increased. Differences in these patterns by sociodemographic groups could affect downstream health equity.

FUNDING: Federal; Academic Institution

PH-225

EVALUATING REGIONS OF INCREASED RISK DURING COVID-19 - ELEVATED SMOKING RATES AND LIMITED HOSPITAL CAPACITY IN TOBACCO NATION

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Areas of the US with high smoking prevalence, including the 13 Southern and Mid-western states we labelled Tobacco Nation (TN), often face significant other systemic challenges, such as limited healthcare access, particularly among rural communities. The combination of high smoking rates and reduced healthcare access, such as living near hospitals with limited capacity, may make these communities particularly vulnerable to the ongoing COVID-19 public health emergency. Facility-specific staffed hospital bed capacity data (Definitive Healthcare) were matched to county population (American Community Survey) to estimate per capita county hospital capacity. These were combined with county-level smoking prevalence data (Behavioral Risk Factor Surveillance System) to examine potential at-risk counties. We categorized the datasets into quantiles and used a series of overlay analyses to map areas with higher smoking and lower capacity. We conducted bivariate hotspots analyses to identify areas with greatest localized clustering. Results show that more than 45% (n=479) of TN counties were in the top 20th national smoking percentile. Communities with lower hospital capacity were present across the US, notably in rural and less urban counties. Approximately 21% (n=225) of TN counties were in the lowest 20th national percentile for hospital capacity. Overlay analyses indicated counties with the highest smoking rates and lowest hospital capacity were predominantly less urban and located in TN or surrounding Southern states. Among counties in both the highest and lowest terciles of smoking and hospital capacity, 72.4% (n=270) were in TN. In cluster analyses, results varied by methodology; however, after robustly accounting for in-situ correlation and multiple comparisons, areas of high smoking and lower capacity were most common in TN and neighboring states, such as Georgia and Florida (p<0.013). Areas of the US with both higher smoking rates and lower hospital capacity were predominantly located in rural counties in TN or neighboring states. The full consequences of COVID-19 remain unknown; however, this research demonstrates the utility and limitations of these data in understanding relevant risks during a global pandemic. While this analysis does not account for complex transmission factors or societal responses, understanding baseline factors, such as historically high tobacco use, that leave communities at potentially greater risk can assist in public health preparedness efforts, particularly in absence of individual-level data.

FUNDING: Other

PH-226

NICOTINE ON PEDIATRIC PATIENTS' HANDS - IMPLICATIONS FOR OVERALL TOBACCO SMOKE EXPOSURE

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Significance: Little is known about the extent to which thirdhand smoke (THS) pollution contributes to children's overall tobacco smoke exposure (TSE). We examined the contribution of THS exposure (THSe) to overall child TSE among tobacco smoke-exposed children and assessed the associations of demographics and self-reported parental smoking and child TSE patterns with hand nicotine and cotinine levels. **Methods:** We



analyzed data from 283 pediatric emergency department patients who lived with a smoker. TSE was measured via hand nicotine levels on handwipe samples among all participants, and overall TSE was measured via urinary cotinine in a sub-sample ($n=88$). Hand nicotine and urinary cotinine were log-transformed to address skewed distributions before conducting Spearman's rank correlation and linear regression analyses. High hand nicotine $>500\text{ng/wipe}$ and cotinine $>100\text{ng/ml}$ were excluded prior to analysis. **Results:** Mean child age (SD) was 5.5 (4.8) years. Most had public insurance (93.6%) and were non-Hispanic (97.9%); 58.3% were Black, 31.8% were White, and 9.9% were other/unknown race. All children had detectable hand nicotine (range: 4.0-498.1 ng/wipe; geometric mean [GeoM]=76.6, 95% confidence interval [CI]=68.2-86.1) and detectable urinary cotinine (range 0.1-97.7ng/ml; GeoM=8.7, 95%CI=7.1-10.5). There was a positive correlation between cotinine and hand nicotine ($p=0.609$). Children who were 2-4-years old (GeoM=96.2, $p=0.03$) had higher mean hand nicotine compared to 0-year-olds (GeoM=64.7). Children with no home smoking bans had higher hand nicotine (GeoM=96.1 $p<0.001$) and cotinine (GeoM=13.6, $p<0.001$) than children with home smoking bans (GeoM=45.8, GeoM=5.0, respectively). Children whose caregivers smoked 15-40 cigarettes/day (GeoM=96.5, $p=0.03$) had higher hand nicotine than those whose caregivers smoked 1-5 cigarettes/day (GeoM=67.1). Children who were around 6-14 (GeoM=89.8, $p=0.04$) or 15-225 (GeoM=116.9, $p=0.001$) daily cigarettes/week had higher hand nicotine than those who were around 0 daily cigarettes/week (GeoM=63.7). No differences were found based on cotinine. **Conclusions:** Children may pick up nicotine on their hands which may create a pathway for overall TSE independent of inhalation. Younger children and those with higher reported TSE had increased nicotine levels, while mean cotinine levels remained high among this group of highly exposed children. Remediation strategies are needed to protect children as even those with home smoking bans had high hand nicotine and cotinine levels.

FUNDING: Federal

PH-227

RACIAL/ETHNIC DISPARITIES IN CIGARETTE AND CIGAR PREVALENCE AND INTENSITY OF USE AMONG EXCLUSIVE, DUAL, AND POLYUSERS

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SIGNIFICANCE: Despite documented racial/ethnic differences in cigar use, disparities in prevalence and intensity of use are unclear in the context of dual and polyuse with cigarettes. **METHODS:** We used nationally representative data (ages 18+) from Wave 4 (2016-17) of the Population Assessment of Tobacco and Health Study to estimate weighted population prevalence and intensity of use for Non-Hispanic White (NHW), Non-Hispanic Black (NHB), Hispanic, and Non-Hispanic Other race (NHO) user categories: exclusive use of 1) cigarettes, 2) traditional cigars, 3) cigarillos, or 4) filtered cigars; dual use of 5) cigarettes and traditional cigars, 6) cigarettes and cigarillos, 7) cigarettes and filtered cigars; or polyuse of 8) cigars or 9) cigarettes and cigars. We defined current use as established every day/some day use and intensity as median number of cigarettes or cigars used per month. We assessed differences in intensity by race/ethnicity using the nonparametric equality of medians test. **RESULTS:** NHB and NHW adults had the highest exclusive cigarette prevalence (17.7% and 17.5%, respectively). NHW exclusive cigarette smokers had the highest intensity of cigarette use (360 vs. NHO: 300, NHB: 240, Hispanic: 150; $p<0.001$). NHB users had the highest exclusive cigarillo use (1.8% vs. Hispanic: 0.3%, NHW: 0.2%, NHO: 0.2%) and cigarette and cigarillo dual use (1.8% vs. Hispanic: 0.5%, NHW: 0.4%, NHO: 0.4%), but NHW cigarette and cigarillo dual users had the highest intensity of cigarette use (300 vs. NHB: 210, NHO: 210, Hispanic: 100; $p=0.001$). Filtered cigar prevalence did not significantly differ by race/ethnicity, but NHW exclusive filtered cigar users had the highest intensity of filtered cigar use (300 vs. NHB: 24, Hispanic: 1, NHO: 0; $p=0.005$). Hispanic cigarette and filtered cigar dual users and NHW cigarette and cigar polyusers had the highest intensity of cigarette use overall (both 600). **CONCLUSION:** While the prevalence of cigarette and cigar use was generally highest among NHB adults, intensity of use was often highest among NHW and Hispanic users. These use pattern distinctions may further explain racial/ethnic disparities in tobacco-related health outcomes.

FUNDING: Federal

PH-228

QUITLINE CALLER CHARACTERISTICS AND SERVICE UTILIZATION AMONG YOUTH - UNITED STATES, 2010-2018

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SIGNIFICANCE Limited evidence is available on effective tobacco product cessation interventions for youth; however, quitlines (QL) are effective for adults, and are a possible referral resource for youth. To better understand how QL serve youth, this study compared the characteristics of, and services received among, U.S. youth QL callers to young adults and other adults. **METHODS** We identified state QLs in the U.S. that serve persons aged <18 -years or use specific youth protocols. Using pooled 2010 - 2018 data from CDC's National Quitline Data Warehouse (NQDW), we conducted chi-square tests to compare demographic and tobacco use characteristics, as well as services received, for youth QL callers (aged <18), young adults (aged 18-24 years), and other adults (aged >25 years). Chi-square trend tests were performed to examine changes in the percent of those aged <18 who registered with the QL. **RESULTS** Forty-six state QL provide counseling services to youth and among these QL, thirty-nine states had specific counseling protocols for youth. During 2010-2018, 12,715, or 0.3% of all state QL callers, were youth. Compared with young adult and other adult callers, youth callers had a higher proportion of males and differences by race/ethnicity across age groups. The proportion of youth use of non-cigarette tobacco products was higher and daily use of any tobacco product was lower compared to adult callers. A lower proportion of youth reported that they intend to quit any tobacco use in the next 30 days (67.2%) than young adult (80.2%) and other adult callers (72.8%). Once registered with the quitline, youth callers received counseling services (92.8%) similar to young adult (91.3%) and other adult (93.6%) callers in 2018. The proportion (2010:0.47%; 2018: 0.11%) of youth callers declined significantly over the study period. **CONCLUSION** Youth QL callers have significantly different demographic and tobacco product use characteristics than adult callers but similar proportions received counseling services. Given the low and declining QL use among youth, research is warranted to identify effective tobacco product cessation interventions for youth.

FUNDING: Federal

PH-229

PREDICTORS OF E-CIGARETTE AND CIGARETTE USE TRAJECTORY CLASSES FROM EARLY ADOLESCENCE TO EMERGING ADULTHOOD ACROSS FOUR YEARS (2013-2017) OF THE PATH STUDY

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Significance: Given the evolving tobacco product landscape and rise of e-cigarettes in youth, understanding tobacco use trajectories among youth and young adults is important to inform efforts to prevent escalation to daily tobacco use and to improve public health. This study examines predictors of trajectories of cigarette and e-cigarette use among a cohort of U.S. youth transitioning into young adulthood. **Methods:** Latent trajectory class analyses identified trajectory classes of youth cigarette and e-cigarette use, separately, using the first 4 waves (2013-2017) of data from the nationally representative PATH Study. U.S. youth (12-17) identified at Wave 1 with data at all four waves ($N=10,086$) comprised the analytic sample. Weighted descriptive analyses described the class characteristics. Weighted multinomial logistic regression analyses examined demographic, psychosocial, and behavioral predictors of class membership. **Results:** Trajectory class structures differed by age group. Youth 12-15 years had lower tobacco use and classes were not stable. In the 16-17 year group, five unique trajectories of cigarette smoking were identified, including a Persistent High Frequency class. Four e-cigarette use trajectories were identified; but not a persistent use class. Shared predictors of class membership for cigarettes and e-cigarettes included mental health problems, other tobacco use, marijuana use, and poorer academic achievement. Male sex and household tobacco use were unique e-cigarette trajectory class predictors. There



was no evidence of an association between e-cigarettes as the first product tried and progression of cigarette trajectories (nor cigarettes as first product and the e-cigarette progression class). **Conclusion:** Analyses revealed younger adolescents had low overall tobacco use and may be primed for prevention initiatives. Interventions should focus on well-established risk factors such as mental health and other substance use as they remain critical targets to preventing progression of any tobacco use to regular use of tobacco in adulthood.

FUNDING: Federal

PH-230

TOBACCO USE AMONG US ADULT "NEVER SMOKERS" IN WAVE 4 (2016-2018) OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: One of the most common criteria for being labeled a "never" smoker in national surveys is having smoked fewer than 100 lifetime cigarettes. However, we could find no empirical support for this cutoff. We examined cigarette and non-cigarette tobacco use among adults who met this "never smoker" criterion. **Methods:** We analyzed cross-sectional data from 15,463 adult "never smokers" (i.e., reported <100 lifetime cigarettes) in wave 4 (2016 to 2018) of the Population Assessment of Tobacco and Health (PATH) study, a United States nationally representative sample. We examined use of cigarettes, electronic cigarettes, cigars, hookah, pipes, smokeless tobacco, and snus according to the following PATH-derived definitions: ever tried, used in the past 30 days, current experimental use (never used regularly but currently use some days or every day), and current, former or ever established regular use. **Results:** Most "never smokers" (i.e., reported <100 lifetime cigarettes) were young adults (52.7%) and had tried tobacco in their lifetime (62.7%). One in five (20.5%) had a lifetime history of regular non-cigarette tobacco use, with the most common being cigars followed by e-cigarettes, hookah, and smokeless tobacco. Further, 8.5% were current regular non-cigarette tobacco users and 4.4% were current established regular users of combustible non-cigarette tobacco. Nearly 1 in 10 (9.5%) "never smokers" smoked cigarettes in the past 30 days and 5.9% currently smoked cigarettes every day or some days, though almost none smoked daily. **Conclusions:** Our findings indicate substantial cigarette and non-cigarette tobacco use among U.S. adults classified as "never smokers" using the standard definition in the field. The 100-cigarette lifetime threshold should not be considered to represent abstinence from cigarette or non-cigarette tobacco products. Research using this criterion to define a "never smoker" reference group may produce underestimates of the relative harms from cigarettes. Research is needed to assess the validity of "never smoker" operational definitions in predicting future 1) cigarette dependence and 2) smoking-related health harms.

FUNDING: Federal

PH-231

USE OF TOBACCO PRODUCTS AND PASSIVE EXPOSURE TO THEM IN EUROPE. THE TACKSHS PROJECT

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Significance: To determine the prevalence of use of cigarettes, heated tobacco products (HTP) and electronic cigarettes (e-cigs), as well as passive exposure to their aerosols in Europe. **Methods:** In 2017-2018, within the TackSHS Project (www.tackshs.eu), we conducted a cross-sectional face-to-face survey in 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania and Spain). In each country, a representative sample of around 1,000 subjects aged

≥15 years was interviewed. The survey gathered information on tobacco smoking, use of HTPs and e-cigs, and secondhand exposure to tobacco smoke (SHS) and aerosols of e-cigs (SHA) in different settings. **Results:** Overall, 25.9% of participants were current smokers (21.2% women, 31.0% men) and 16.5% were former smokers (from 18.9% in Italy to 37.0% in Bulgaria). Smoking prevalence decreased with increasing age and education level. 1.8% were ever HTP users (from 0.6% in Spain to 8.3% in Greece), and 0.1% were current users. HTP use was less frequent in women than men, was inversely related to age and more frequent in ever smokers and ever e-cig users. Prevalence of e-cigs use was 2.4% overall (2.3% women, 2.5% men and inversely related to age) ranging from 0.6% in Spain to 7.2% in England. 30.9% of non-smokers (29.0% women, 33.2% men) reported being exposed to SHS in indoor settings (median time 60 min/day). The prevalence of SHS exposure was 13.1% at home, 11.4% at the workplace, 4.7% in private transportation, 4.0% in public transportation, and 14.7% in "other indoor settings" (leisure including bars and restaurants). Overall, 16.0% of e-cigs non-users were exposed to SHA in any indoor setting at least weekly (from 4.3% in Spain to 29.6% in England). The median duration of SHA exposure was 43 min/day. "Other indoor settings" was the place where most e-cigs non-users were exposed (8.3%), followed by workplace/educational venues (6.4%), home (5.8%), public transportation (3.5%) and private transportation (2.7%). **Conclusions:** Cigarette smoking and SHS exposure continue to be highly prevalent, while the use of HTP and e-cigs and exposure to their aerosols is still limited. Implementation and enforcement of stricter legislation at the national and European level to tackle the tobacco epidemic is still needed.

FUNDING: Federal; State; Nonprofit grant funding entity

PH-232

CURRENT TOBACCO USE AND ADHERENCE TO SOCIAL DISTANCING RECOMMENDATIONS FOR CORONAVIRUS DISEASE (COVID-19) IN A COHORT OF MALE YOUTH AND YOUNG ADULTS

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Significance: Social (physical) distancing is crucial in controlling the spread of COVID-19, and adherence to social distancing recommendations are reported to be lower among young people. We investigated if adherence differed by current (past 30-day) tobacco use status among male youth and young adults. **Methods:** The Buckeye Teen Health Study is an ongoing cohort study of male youth and young adults residing in rural Appalachian and an urban area of Ohio. Between June and August, 2020, participants were asked to complete a COVID-19 specific survey. Seven items assessed social distancing and other risk reducing practices during the past 30 days: Staying at home except for essential tasks, avoiding visiting friends and family who don't reside in the same house, avoiding letting friends and family who don't live with participants come into the household, maintaining a distance of six feet, wearing face coverings inside indoor places, wearing face coverings outdoors, and not attending a gathering of more than 10 people aside from work reasons. Items were also summed to create a 0-7 scale as an indicator of overall social distancing adherence. We assessed the associations between current tobacco use and adherence to social distancing recommendations individually and collectively using a log-binomial model and a Poisson model with robust error variance, respectively. **Results:** The sample contained a total 515 participants (mean age 18.4 +/- 1.6). Models controlled for age, region, household income, baseline sensation seeking, any peer tobacco use, and a time indicator for statewide change in face covering recommendations during the data collection period. Compared to non-current users, current tobacco users were less likely to report wearing face coverings in outdoor spaces (aRR: 0.58, 95% CI: 0.32-0.93, p=0.036). Adherence to all social distancing recommendations was also lower for current tobacco users, although this difference did not reach statistical significance (aRR: 0.87, 95% CI: 0.74-1.03, p=0.102). **Conclusion:** Although social distancing adherence for COVID-19 did not differ for all recommendations, there was some evidence of less adherence for youth currently using tobacco products. With potentially increased physical interactions in school and other settings, not using face coverings can accelerate the spread of infection.

FUNDING: Federal



PH-233

SOCIODEMOGRAPHIC PATTERNS OF EXCLUSIVE AND DUAL USE OF MENTHOL/NON-MENTHOL CIGARETTES AND ENDS AMONG US YOUTH (AGES 15-17) - POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY (2013-2017)

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Significance: In recent years, ENDS use among youth has increased alarmingly due to misleading health claims and the availability of new products and flavors. Findings that ENDS use could potentially serve as a gateway for cigarette use have sobering implications knowing that youth are more likely to smoke menthol cigarettes, which can make quitting tobacco harder. Examining sociodemographic patterns of exclusive and dual use of menthol/non-menthol cigarettes and ENDS may give more insight into disproportionately affected populations. **Methods:** Using nationally representative data on youth (aged 15-17) from four waves (2013-2017) of the Population Assessment of Tobacco and Health (PATH) Study, we calculated the weighted population prevalence for each category of current cigarette and ENDS use (i.e., exclusive menthol cigarette, exclusive non-menthol cigarette, exclusive ENDS, dual menthol cigarette and ENDS, and dual non-menthol cigarette and ENDS) by sex, race/ethnicity, and parental education level, as well as household income and homeownership (neither obtained in Wave 1). **Results:** Prevalence of exclusive menthol cigarette use decreased among non-Hispanic Whites from 3.48% in Wave 1 (n=6651) to 1.66% in Wave 4 (n=7461). Exclusive ENDS use increased among non-Hispanic Whites (W1: 2.93% to W4: 6.86%) and those with higher socioeconomic status represented by higher parental education, higher household income (W2 (n=5906): 3.92% to W4: 6.30%), and homeownership (W2: 3.66% to W4: 5.81%). Exclusive non-menthol cigarette use and dual use of cigarettes and ENDS remained stable, except for dual menthol cigarettes and ENDS use, which decreased among males (W1: 1.68% to W4: 0.90%). **Conclusion:** From 2013 to 2017, exclusive menthol cigarette use declined, but exclusive ENDS use, particularly by non-Hispanic Whites and youth with high socioeconomic status, drove the increase in tobacco use among 15-17-year-olds in the US. Except for dual menthol cigarettes and ENDS use decreasing among males, dual use remained relatively stable across this time. Monitoring changes in these sociodemographic patterns will help inform future strategies targeting youth tobacco prevention.

FUNDING: Federal

PH-234

TOBACCO USE CAUSES PREMATURE MORTALITY IN PERSONS WITH SERIOUS MENTAL ILLNESS: A CALL TO ACTION

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Significance: Persons with serious mental illness die 10-20 years younger than those in the overall population. Most of the premature deaths are from natural causes such as cardiac, neoplastic, and pulmonary disease. We examined the role of tobacco smoking in natural cause mortality in a cohort of individuals with serious mental illness assessed prospectively. **Methods:** Persons with schizophrenia (n=861), bipolar disorder (n=533), and major depression (n=100), mean age of 37.7 (s.d. 12.7) years, were enrolled and assessed about their tobacco use and demographic and clinical variables. Mortality was subsequently determined with data from the National Death Index following a period of up to 19.9 years. Cox regression models including age at assessment were generated to determine independent predictors of mortality from baseline variables. **Results:** At baseline, 743 (49.7%) of participants reported that they smoked tobacco: 21% smoked >0- <=0.5 packs per day (ppd), 19% smoked > 0.5 - <1 ppd, and 9% smoked > 1 ppd. Participants were followed for a median observation period of 10.1 years. During the follow-up, 8.4% (125/1494) of persons died of natural causes; the standard mortality ratio was 1.81 (95% CI 1.52, 2.15). The most common causes were diseases of the circulatory system (43%), neoplasms (25%), and respiratory disease (14%). The mean age at death was 58.4 years (range 19.4 - 79.1 years). Tobacco smoking at baseline was the strongest predictor of mortality (Hazard Ratio 2.84, 95% CI 1.89, 4.29, p< 3.18 10⁻⁷). The hazard of mortality increased with the number of packs per day smoked increasing from 1.48 (95% CI .82, 2.69) in individuals who smoked <0.5 ppd to 5.13 (95% CI 3.19, 8.24) in those who smoked >1 ppd as compared to non-smokers. Other factors associated with increased mortality included divorced/ separated status, lower cognitive score, and having diabetes. **Conclusions:** Tobacco smoking more than doubles the risk of natural cause mortality in persons with serious mental illness independent of other determinants. Smoking cessation treatment for this population, and policy changes to decrease access to tobacco, are imperative to reduce this preventable loss of life.

FUNDING: Nonprofit grant funding entity

PH-235

HOW MANY STUDENTS VAPE IN SCHOOL AND WHAT ARE THE CONSEQUENCES?

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Significance: The prevalence of vaping has increased dramatically, and the rapidly changing devices present challenges to schools as students find creative ways to covertly vape. There are many media reports of an increasing number of students vaping inside the school, but to our knowledge there are no published data about the frequency of this behavior according to both students and school staff. There are also a lack of data for the disciplinary approaches that are being used by schools to address students caught vaping in school. The objectives of this study are to (1) identify the prevalence of students and school staff seeing vaping in school and (2) identify the disciplinary measures used by school staff when students are caught vaping in school. **Methods:** Representative, cross-sectional student data collected during the 2019-20 California Student Tobacco Survey identified the prevalence of students who reported seeing vaping in school. Data from school staff across California collected during the 2019-20 California Educator Tobacco Survey identified the prevalence of school staff who reported seeing vaping in school and the disciplinary measures described by participants. **Results:** In 2019-20, 60% of students reported seeing another student use vapes at school in the last 30 days. The most popular locations where vaping was last seen was in the bathroom, outside on school grounds, and in a classroom. 10% of school staff reported catching a student vaping in class in the last semester. The disciplinary measures reported by school staff varied, ranging from authoritarian to restorative. In some cases, there were no consequences or school staff were unsure of the consequences. **Conclusions:** The majority of students and many school staff reported seeing vaping in school. Given that disciplinary measures varied widely, additional support is necessary to help schools address student vaping on campus.

FUNDING: State

PH-236

BEYOND A DIFFERENCE IN PREVALENCE - EXPLORING SMOKELESS TOBACCO USE IN APPALACHIAN AND NON-APPALACHIAN OHIO

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Significance. A higher prevalence of smokeless tobacco (SLT) use in Appalachia contributes to cancer disparities when compared to non-Appalachian regions of the United States. We directly compared characteristics of SLT users and products used in Appalachian and non-Appalachian Ohio. We also evaluated whether product characteristics were associated with SLT dependence or cessation plans among Appalachian adults. **Methods.** Adult SLT users in Appalachian (N=105) or non-Appalachian (N=33) Ohio completed an interview as part of a larger study in 2018-2020. Analyses compared distributions of 1) demographic variables and tobacco use history by region and 2) flavored SLT use, price promotion use, and cessation plans by region and SLT product. Within a sub-sample of Appalachian snuff users (N=87), we also estimated whether flavored SLT use and price promotion use were associated with SLT dependence and cessation plans. **Results.** Appalachian SLT users were older, of lower socioeconomic status, and initiated tobacco use at a younger age than non-Appalachian SLT users (p's <0.05). Appalachian snuff users were marginally less likely than non-Appalachian snuff users to: use flavored snuff (57.0% vs. 73.3%, respectively; p=0.13) or price promotions (17.2% vs. 33.3%, respectively; p=0.08), or to plan to quit snuff (40.2% vs. 66.7%, respectively; p=0.05). They also used marginally more snuff per day (6 vs. 5 times, respectively; p=0.12). Use of flavored SLT or price promotions were not associated with SLT dependence or cessation plans among Appalachian snuff users. **Conclusion.** Differences in SLT user characteristics, and potential differences in product characteristics and purchase behaviors, exist between Appalachian and non-Appalachian SLT users. To reduce tobacco-use and health disparities, interventions should be tailored to this setting. Some policies aiming to reduce SLT use overall, such as bans on flavors or price promotions, might have greater impact among non-Appalachian SLT users.

FUNDING: Federal; Academic Institution



PH-237

SEX AND SEXUAL IDENTITY DIFFERENCES IN TOBACCO PRODUCT USE BY AGE GROUP WITHIN THE U.S

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Significance: U.S. sexual minorities are at increased risk for tobacco use; however, research suggests there is heterogeneity in this risk by sociodemographic factors. Questions remain about the degree of risk for different tobacco products and if this vulnerability varies across the life course for sexual minority males and females. This study examined age-related differences in tobacco use by sex and sexual identity. **Methods:** We used adolescent and adult survey data from wave 4 of the Population Assessment of Tobacco and Health study (Dec/2016-Jan/2018). We examined the prevalence of past 30-day e-cigarette use, cigarette use, other tobacco use, and the number of tobacco products used by sex and sexual identity (heterosexual, gay/lesbian, or bisexual) among four age groups (14-18, 19-29, 30-44, and 45-60). **Results:** Among males, sexual identity differences in e-cigarette and cigarette use were largest in magnitude among those ages 45-60; other tobacco use differences among males were inconsistent across age. For example, among 45-60 year olds bisexual men had a five times greater odds of e-cigarette use (aOR=5.6 [95% CI=1.4, 21.6]) and three times greater odds of cigarette use (aOR=2.8 [95% CI=1.1, 7.2]) compared to heterosexual men of the same age. There were no significant differences by sexual identity among males age 14-18. Among females, sexual identity differences in tobacco use were largest in magnitude for young adults. For example, 19-29 year old bisexual females had three times greater odds of cigarette use (aOR=3.1 [95% CI=2.5,3.9]) compared to heterosexual females of the same age. **Conclusions:** Sexual identity differences varied considerably by age group and tobacco product. In particular, mid-adult sexual minority males and young adult sexual minority females are at particular risk for tobacco use. Understanding these differences in risk by age group has important implications for U.S. tobacco regulatory policies that aim to reduce tobacco-related health disparities. This research was supported by funding from the National Institute on Drug Abuse (R21DA051388, R01DA044157, R01DA043696) and the National Cancer Institute (R01CA203809 and R01CA212517). 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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PH-238

ASSOCIATION OF BASELINE DAYTIME SLEEPINESS WITH OTHER PSYCHIATRIC CONDITIONS AND SMOKING CESSATION OUTCOMES AMONG CANCER PATIENTS

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Introduction: Sleep disturbances are common among smokers and have predicted success of smoking cessation. No prior studies were found that assessed sleep in relation to cessation outcomes in cancer patients. **Methods:** To examine sleep in relation to other characteristics prior to smoking cessation, and explore whether sleep may predict cessation outcomes, we conducted an observational study using prospectively collected data on 342 cancer patients referred to the Roswell Park QuitClinic, an oncology-based, tobacco cessation program. Baseline daytime sleepiness was assessed using Epworth Sleepiness Scale (ESS) scores among 339 patients. Of those, 216 completed at least one follow-up visit and 88 had outcome data at 6 months. Patient characteristics and psychiatric conditions at baseline were compared between patients with normal (ESS score<=10, n=296) vs. abnormal (ESS>10, n=43) daytime sleepiness, using Fisher exact or Wilcoxon rank sum tests. Spearman correlation coefficients were calculated between these variables and continuous ESS scores. Logistic and linear regression was used to explore whether baseline ESS scores and well-established cessation indicators could independently predict cessation outcomes. **Significance** was set at an alpha=0.05. **Results:** Compared to patients with normal ESS scores, those with abnormal sleep were less likely to be white, more likely to be Hispanic, unpartnered, had lower income and exhibited higher scores of depression, stress, perceived discrimination, and delay discounting. Patients with abnormal ESS scores also began smoking at an earlier age and were less likely to have a recent quit attempt. Patients with higher ESS score at baseline was less likely to quit smoking successfully at 6 month, with an OR=0.86 [0.75-0.99; p=0.03]. Other variables found to predict success of smoking cessation were: baseline Fagerstrom Test for Nicotine Dependence (FTND) score, OR=0.78 [0.61-0.99; p=0.04], income, OR=1.59 [1.00-2.53; p=0.05] and CPD, OR=0.89 [0.83-0.96, p=0.002]. Adjusting in the multivariable model did not change effect sizes for ESS score and CPD, while the OR (1.91) for income increased, suggesting their independent effects.

Conclusion: Our data show significant association between daytime sleepiness and other psychiatric conditions prior to smoking cessation in cancer patients. Data also suggest daytime sleepiness, income and CPD may independently predict success of smoking cessation, which should be confirmed in a larger sample.

FUNDING: Unfunded; Academic Institution

PH-239

EXAMINING TRUTH AND STATE-SPONSORED MEDIA CAMPAIGNS AS A MEANS OF DECREASING YOUTH SMOKING AND TOBACCO-RELATED HEALTH DISPARITIES IN THE U.S.

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Significance: Tobacco-related disparities are pervasive, and little research has recently been done to demonstrate whether anti-tobacco media campaigns differ in effectiveness for individuals that are disproportionately affected. The purpose of this study was to analyze the impact of Truth and state-sponsored anti-tobacco media campaign exposure on youth smoking in the United States, and their potential to reduce tobacco-related health disparities and improve downstream health equity. **Methods:** Modified Poisson Regression was used to assess the impact of a Respondent's Gross Ratings Points on past 30 day smoking participation, first cigarette initiation in the current grade, daily smoking initiation in current grade, and intention to smoke in the next five years. Interactions with sex, parental educational attainment, college plans (among 12th graders), and race/ethnicity were used to test for differential effects of campaign exposure on all three outcomes of interest. Respondent level demographic and outcome data was collected from Monitoring the Future, and exposure data was collected from Nielsen Media Research. **Results:** Higher levels of media campaign exposure was associated with lower probabilities of past smoking participation among 8th and 12th graders, smoking intentions among 8th graders, and initiation in the current grade among 8th graders. The impact of media campaign exposure was significantly stronger in reducing the likelihood of smoking participation among 10th and 12th grade males, 10th and 12th graders with parents of lower educational attainment, and 12th graders that planned not to go to college. **Conclusions:** Media campaign exposure was associated with a lower likelihood of youth smoking behaviors, and were more effective for groups disproportionately affected by tobacco, meaning media campaigns could be useful in reducing health disparities and improving downstream health equity.

FUNDING: Federal

PH-240

THE ASSOCIATION OF INTERNALIZING AND EXTERNALIZING PROBLEMS ON THE AGE OF E-CIGARETTE INITIATION IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) USA YOUTH (2013-2017)

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Significance The association of internalizing and externalizing problems has been reported with an increased risk for initiating e-cigarettes, cigarettes and dual tobacco product use in youth. However, it is unknown if internalizing and externalizing problems are associated with earlier ages of e-cigarette initiation outcomes in youth. **Methods** Secondary analyses of PATH youth (12-17) in waves 1-4 (2013-2017) were conducted. Among never e-cigarette users at the first wave of PATH participation (n=16,143; N=29,349,76), the age of initiation of ever and past 30-day e-cigarette use was estimated in follow-up years (2014-2017). The GAIN-SS is a validated measure for internalizing and externalizing problems in youth. Youth were classified as none/low (0-1 symptoms), moderate (2-3 symptoms), and high (≥4 symptoms) internalizing and externalizing problems in the past year measured at the first PATH wave of participation. Weighted interval-censored Cox proportional hazard models were fitted to estimate the associations of internalizing and externalizing problems with the age of initiation of both e-cigarette outcomes. **Results** By age 18, of those reporting high internalizing problems 50.4% and 30.4% reported ever and past 30-day e-cigarette use, respectively. By age 18, of those reporting high externalizing problems 49.8% and 29.8% reported ever and past 30-day e-cigarette use, respectively. Youth with high internalizing problems have increased risks of ever use (RR=1.86;95%CI=1.69-2.06), and past 30-day use



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(RR=1.83;95%CI=1.60-2.09) of e-cigarettes at earlier ages compared to youth with none/low internalizing problems. Youth with high externalizing problems have increased risks of ever use (RR=2.31;95%CI=2.03-2.62), and past 30-day use (RR=2.41;95%CI=2.03-2.86) of e-cigarettes at earlier ages compared to youth with none/low externalizing problems. Results will be presented for onset of susceptibility to e-cigarettes among previously non-susceptible youth. **Conclusions** Prevention efforts through health providers on the harms of nicotine addiction and other adverse health outcomes in e-cigarettes should target youth with high internalizing or externalizing problems.>

FUNDING: Federal

PH-241

FIRST-YEAR COLLEGE SMOKING IS LINKED TO LOWER ODDS OF COLLEGE COMPLETION IN A U.S. NATIONALLY REPRESENTATIVE COHORT

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Significance: College education is linked to an improved quality of life and better health outcomes in the U.S. It is established that high school smoking is associated with lower odds of enrolling into college. However, no studies to date have assessed the role of smoking during freshman year on college completion in a nationally representative cohort. This study examined the association between smoking in the first year of college and college completion four years later in a longitudinal study of U.S. 4-year-college students. **Methods:** Data were collected annually from a nationally representative cohort of 4-year-college students who participated in the NEXT Generation Health Study between 2013 and 2017 (N=775). Participants reported past-30-day smoking during the first year of college and reported whether they completed college four years later. Weighted logistic regression models were used to assess the association between smoking during the first year of college and on-time college completion. These analyses controlled for gender, race/ethnicity, parent education, alcohol use, and depression symptoms during the first year of college. **Results:** Overall, 17% of college freshmen reported past-30-day smoking, and 56% reported completing college four years later. Students who smoked during the first year of college were less likely to complete a 4-year university degree on time than those who did not smoke (39% vs. 60%; AOR=0.43, 95%CI=0.22-0.82). Covariates associated with lower odds of college completion included being non-Hispanic black (compared to non-Hispanic white) and having a parent with high school or less education or some college education (compared to having a parent with a bachelor's degree). **Conclusion:** Smoking during the first year of college is associated with being subsequently less likely to complete college on time. Implementing tobacco-free policies and providing tobacco cessation treatments on college campuses may boost on-time college completion.

FUNDING: Federal

PH-242

ASSOCIATION OF TOBACCO PRODUCT USE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) PREVALENCE AND INCIDENCE IN WAVES 1 THROUGH 4 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance: The effect of non-cigarette tobacco use on COPD prevalence and incidence is not clearly defined. The goal of this study is to determine the relationship between commonly used tobacco products and COPD prevalence and incidence in the PATH Study. **Methods:** Adults ≥ 40 , with complete Waves 1-4 (2013-2017) data were included. COPD was defined as self-reported diagnosis of ever COPD, chronic bronchitis, or emphysema. Past 30-day tobacco use was defined two ways; 1) non-mutually exclusive categories (none, cigarettes, electronic nicotine delivery systems (ENDS), cigars, smokeless tobacco, hookah) and 2) exclusive categories (never, former, cigarette

(referent), ENDS, cigar, smokeless, hookah, pipe, cigarette and ENDS, poly combustible, poly combustible and non-combustible, ENDS and smokeless). Multivariable weighted Poisson regression obtained adjusted risk ratios for COPD prevalence and incidence. Covariates included sociodemographics, pack years of smoking, asthma, marijuana use, second hand smoke exposure, and comorbidity index. **Results:** Mean (SE) age was 57.5 (0.1) years, with a mean (SE) of 9.5 (0.2) pack years. COPD prevalence at Wave 1 was 6.6%. In Model 1, cigarette (n=3659) and smokeless tobacco (n=451) were associated with higher COPD prevalence (RR=2.30 (1.64, 3.24); 1.47 (1.09, 1.97)). In Model 2, compared to exclusive cigarette use, poly combustible use (n=398) was associated with higher COPD prevalence (RR=1.39 (1.03, 1.87); never (n=2530), former (n=1427), and exclusive cigar use (n=251) was associated with lower prevalence (RR=0.31 (0.22, 0.43); 0.63 (0.48, 0.83); 0.36 (0.14, 0.92)). Cumulative COPD incidence in Waves 2-4 was 4.5%. In Model 1, cigarette use was associated with increased COPD incidence (RR=1.91 (1.19, 3.06)), and in Model 2, never or former cigarette users had decreased risk (RR=0.53 (0.34, 0.83); 0.49 (0.31, 0.77)). ENDS use (n=862) was not significantly associated with COPD prevalence or incidence. **Conclusion:** In a nationally representative sample, when accounting for multiple covariates, preliminary analyses indicated cigarette use was consistently associated with increased prevalence and incidence of COPD in adults age 40 and above, while ENDS use was not.

FUNDING: Federal

PH-243

ANTI-SMOKING MEDIA CAMPAIGNS AND DISPARITIES IN SMOKING CESSATION IN THE UNITED STATES, 2001-2015

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Significance: Our study evaluated sociodemographic differences in the relationship between state and national anti-smoking media campaigns and cessation behaviors among adult smokers in the U.S., to shed light on how recent media campaigns impact cessation and tobacco-related health disparities. **Methods:** This repeated cross-sectional analysis utilized a nationally representative sample of 76,278 year-ago smokers, ages 18 and older, from the 2001-2015 Tobacco Use Supplement to the Current Population Survey. Area-level exposure to both State-sponsored and "Tips" anti-tobacco media campaigns was the primary predictor of this study. Outcome variables included: quit attempt in the past 12 months, past 30-day smoking cessation, and past 90-day smoking cessation among year-ago smokers. We conducted modified Poisson regression models to examine the association between media campaign exposure and cessation behaviors. We also examined effect modification on the additive scale by sex, race/ethnicity, income, and education using average marginal effects. **Results:** Year-ago smokers with greater exposure to anti-smoking media campaigns (4800+ Gross Rating Points) were more likely to report 30-day (Prevalence Ratio [PR]: 1.18, 95% CI: 1.03, 1.36) and 90-day cessation (PR: 1.18, CI: 1.00, 1.41) compared to respondents with less campaign exposure. We found no evidence of effect modification for any of the relationships for any of the sociodemographic variables. **Conclusion:** Exposure to anti-smoking media campaigns was associated with cessation among year-ago adult smokers between 2001-2015. However, there were no differences in the association by sex, race/ethnicity, income or education, indicating that broadly focused media campaigns may be insufficient to reduce smoking cessation disparities.

FUNDING: Federal

PH-244

THE IMPACT OF CURRENT TOBACCO PRODUCT USE DEFINITIONS ON ESTIMATES OF TRANSITIONS BETWEEN CIGARETTE AND E-CIGARETTE USE

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Background: Definitions of current tobacco product use vary and depend on frequency of use, established use criteria, and the product type. It is not known how and to what extent estimates of transition rates between different tobacco products depend on the choice of current use definition. **Methods:** We applied a multistate transition model to data on adults from Waves 1-4 (2013-17) of the Population Assessment of Tobacco Health (PATH) study, accounting for complex survey design. We estimated transition rates between never, non-current, cigarette, electronic nicotine delivery system (ENDS), and dual user states with and without established-use criteria (has smoked 100+ cigarettes;



ever fairly regular ENDS user) and different definitions of current use frequencies (using in 1+, 10+, 20+, and 30 days of the past 30 days). We used two categories of models: treating infrequent use (use below the frequency threshold) as 1) non-current use and 2) a pattern of use distinct from non-current or frequent use. Results: When treating infrequent use as non-current use, transition probability estimates were largely robust to the choice of current use frequency, although sole ENDS users were more likely to transition to non-current use or dual use when using higher thresholds. Removing the established-use criterion for ENDS decreased the estimates of persistence of sole ENDS and dual use, e.g., decreasing one-wave persistence from 57% and 41% respectively to 47% and 34% when using a 1+ days used definition. Transition probability estimates were largely robust to removal of the established criterion for cigarettes. When treating infrequent use as a separate category, transition probability estimates were dependent on the choice of current use threshold. Comparing the 10+ to the 30-day frequency definition, persistence of infrequent use of cigarettes increased from 33% to 48%, while persistence of infrequent ENDS use increased from 15% to 23%. Transitions among the dual use states also changed substantially. Conclusions: Product use definitions have important implications for assessing product use transitions and thus the public health implications of cigarette and e-cigarette control strategies. In particular, greater attention needs to be placed on understanding patterns of infrequent use.

FUNDING: Federal

PH-245

CHOICES MATTER: HOW RESPONSE OPTIONS FOR SURVEY QUESTIONS ABOUT SEXUAL IDENTITY AFFECT POPULATION ESTIMATES OF ITS ASSOCIATION WITH TOBACCO, ALCOHOL AND OTHER DRUG USE

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Significance: Sexual minorities are at increased risk of tobacco use and associated health consequences. Most prior studies of tobacco use among sexual minorities have performed secondary analyses of national survey data sets. Therefore, the response options provided for survey questions about sexual identity are critically important for understanding subgroup differences in tobacco use. **Methods:** We present results from a randomized experiment in the 2015-2017 National Survey of Family Growth (NSFG), where a large national sample of U.S. individuals aged 15-49 years was randomly assigned to one of two different versions of a survey question about sexual identity: one with three response options, including heterosexual, gay/lesbian, and bisexual (TG1), and one adding the option "something else" (TG2). The NSFG also collects several validated substance use measures. **Results:** Analyses of changes in the associations of sexual identity with substance use across these two treatment groups revealed evidence of significant attenuation of subgroup differences when fewer response options are available, and significant differences in the associations that remained robust after adjusting for other factors. The estimated odds ratios for TG1 suggested higher odds of substance use for lesbian women than for bisexual women, while the analyses for TG2 suggested the opposite. When removing the "something else" respondents and testing interactions between treatment group and sexual identity, we found evidence of significant changes in these associations for cigarette smoking. **Conclusions:** Our study suggests that when individuals choose their sexual identity from fewer response options, the heterogeneity of the sexual identity subgroups increases, weakening estimated associations of sexual identity with substance use. Our findings offer compelling evidence that researchers should exercise caution when comparing health studies that use different measures to assess sexual identity, as these studies could produce substantially different conclusions about tobacco-related health disparities and provide support for more open-ended measurement of sexual identity.

FUNDING: Federal; Nonprofit grant funding entity

PH-246

DIFFERENCES IN ELECTRONIC NICOTINE DELIVERY SYSTEMS INITIATION AMONG ADOLESCENTS TRANSITIONING INTO YOUNG ADULTHOOD BY SEXUAL ORIENTATION

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Significance: Early-onset of Electronic Nicotine Delivering Systems (ENDS) use puts users at higher risk of developing a regular use pattern and/or transitioning to combusted tobacco products. Previous studies assessing differences in ENDS use by sexual orientation

among adolescents have not considered sexual orientation as a fluid trait that can change over time. Our objective was to assess whether ENDS initiation differed by sexual orientation in a longitudinal, population-based cohort of adolescents transitioning into young adulthood (13-19 years old) residing in the 4 largest cities in Texas (San Antonio, Dallas, Fort Worth, Houston, and Austin). **Methods:** The study population was drawn from the Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) and included students responding to waves 5 through 9 (2016-2019). The analysis sample was limited to participants who reported never using ENDS at wave 5, who completed at least two of the three waves that measured sexual orientation, and had no missing data on birthdates or survey dates (n=1215; N=143,688). This sample was stratified into 3 groups, representing sexual orientation: 1) Respondents who reported being heterosexuals at each wave (Straight), 2) Those who consistently self-identify as sexual minority individuals (SM), and 3) Subjects who reported sexual orientation mobility across waves (Fluid). Non-parametric models for interval-censored data were used to estimate the cumulative distribution of age at ENDS initiation, by sexual orientation group. Cox models for interval-censored data were used to estimate whether this varied by gender, race/ethnicity, and socioeconomic status. All analyses were conducted to incorporate the complex sampling weight in TATAMS. **Results:** Compared to Straight adolescents, the risk of early-onset of ENDS use was higher among Fluid individuals (HR=1.31, 95% CI: 1.27-1.35) and SM individuals (HR=1.40, 95% CI: 1.36-1.44), respectively. Differences between Straight adolescents and SM/Fluid individuals became more pronounced with increasing age. The risk of early-onset of ENDS use was lower for Fluid individuals (HR = 0.94, 95% CI: 0.90 - 0.97) when compared to SM adolescents. There were significant interactions among gender, race/ethnicity, and socioeconomic status in predicting early-onset of ENDS use. **Conclusion:** Interventions to prevent ENDS initiation among adolescents transitioning into young adulthood should focus efforts on sexual minority youth and adolescents whose sexuality is fluid.

FUNDING: Federal

PH-247

TIME SPENT USING SOCIAL MEDIA AND THE RISK OF SUBSTANCE USE INITIATION AMONG U.S. ADOLESCENTS AND YOUNG ADULTS

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Significance: Adolescents are at risk for the initiation of substance use behaviors. If social media screen time is found to be correlated with onset of substance use, it can serve as a relevant platform for future intervention and public health policy. The purpose of this study is to examine the association between social media screen time and onset of substance use at one year follow-up among 18,382 adolescents from the Population Assessment of Tobacco and Health (PATH) study. **Methods:** Using data from the longitudinal, nationally-representative PATH study, daily social media screen time (none [reference group], less than 30 minutes, greater than 30 minutes to 3 hours, greater than 3 hours to 6 hours, and greater than 6 hours) was assessed at baseline (Wave 2: 2014-2015) and compared to tobacco (i.e., combustible tobacco, electronic nicotine delivery systems [ENDS]) and other substance use (i.e. alcohol, marijuana, illicit drugs) status changes at follow-up (Wave 3: 2015-2016). Youth and young adults (N=18,382), 12 to 25 years old during baseline, participated in both baseline and follow-up, and provided valid responses on primary interest variables and outcomes. Accounting for multiple covariates, survey-weighted logistic regressions were applied to obtain estimates. **Results:** 7,655 participants from PATH dataset reported no substance use at baseline. At follow up, we documented 1,756 participants initiated substance use (as shown in Table 2). Of these participants, 478 participants started using tobacco (as shown in Table 3). Data demonstrated a stepwise increase between social media use time at baseline and risk of substance use onset at follow up (p for trend <.001). With regard to tobacco products, use of social media was associated with higher odds of starting ENDS use, and this association increased with prolonged time spent on social media. **Conclusion:** Increasing amounts of social media exposure correlated with a higher likelihood of substance use initiation in adolescents, especially the use of legal substances. Given this strong association, further analysis on advertisements and promotions of legal substance use on social media could be an important platform for future research. Results also suggest that social media may serve as a relevant platform for outreach, intervention, and public health policy.

FUNDING: Federal



PH-248

AGE DIFFERENCES IN MODERATE-TO-SEVERE TOBACCO USE DISORDER AS A FUNCTION OF DISCRIMINATION AMONG U.S. SEXUAL MINORITIES

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Significance: Limited attention has been paid to age-related differences in tobacco use disorder (TUD) and its risk factors among sexual minorities. This can obscure the differential needs of sexual minority age cohorts for tobacco prevention, cessation, and screening for tobacco-related diseases. We examined the association between cumulative racial/ethnic and sexual orientation discrimination and moderate-to-severe TUD for U.S. sexual minority adults aged ≥ 45 years based on their risk for tobacco-related consequences and eligibility for lung screening. **Methods:** Using cross-sectional data from the 2012-2013 National Epidemiologic Survey of Alcohol and Related Conditions-III ($N=36,309$ U.S. adults), sexual minorities were defined as lesbian/gay-, bisexual-, and heterosexual-identified adults with same-sex attraction/behavior. We conducted multivariable logistic regression analyses to estimate the association of lifetime racial/ethnic and sexual orientation discrimination with moderate-to-severe TUD and to test whether the association differed for 45-64 year olds compared to adults 65 and older. **Results:** An estimated 11.9% of this target population met criteria for moderate-to-severe TUD. Lifetime racial/ethnic and sexual orientation discrimination was not significantly associated with moderate-to-severe TUD for U.S. sexual minority adults aged ≥ 45 years. However, a significant interaction was found between discrimination and age for moderate-to-severe TUD such that lifetime racial/ethnic and sexual orientation discrimination was significantly associated with moderate-to-severe TUD for sexual minority older adults aged ≥ 65 years but not adults aged 45-64 years. **Conclusions:** Higher levels of cumulative discrimination were associated with increased risk for moderate-to-severe TUD among sexual minority adults aged ≥ 65 years. Our findings underscore the importance of age considerations in the assessment and treatment of TUD. Future research should include a larger sample of older sexual minority adults to examine potential generational differences in the influence of structural-level discrimination and stressors encountered by sexual minorities.

FUNDING: Federal; Nonprofit grant funding entity

PH-249

CORRELATES OF SMOKING CESSATION BEHAVIORS AMONG DUAL USERS OF CIGARETTES AND E-CIGARETTES

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Significance: It is critical to understand determinants of smoking cessation in the current tobacco product landscape. This study assesses the role of e-cigarette flavoring, device type, and frequency of use on cigarette-quit intentions and attempts among U.S. adult cigarette and e-cigarette dual users. **Methods:** We analyzed a sample of 1,096 adult dual users of cigarettes and e-cigarettes from the 2018-2019 Tobacco Use Supplement-Current Population Survey. We ran modified Poisson models to examine the relationship between cigarette and e-cigarette characteristics and the intention to quit smoking in the next month or next six months, and smoking quit attempts in the last year. Predictor variables included the type of e-cigarette device (disposable, replaceable, tank, mod), e-cigarette flavor (tobacco, menthol, fruit, other), cigarette flavor (menthol, non-menthol), frequency of use (daily, non-daily), and nicotine dependence (time to first cigarette and e-cigarette). Models were adjusted for sex, age, race/ethnicity, and income. **Results:** Daily vs. non-daily e-cigarette use (prevalence ratio (PR)=1.27, CI 95% 1.07-1.52) and cigarette use (PR=0.49, CI 95% 0.41-0.59) were associated with the intention to quit in the next month, but in the opposite direction. Tank e-cigarette users (PR=1.27, CI 95% 1.07-1.52) and mod device users (PR=1.35, CI 95% 1.07-1.52) were more likely to intend to quit cigarettes in the next six months, compared to disposable e-cigarette users. Finally, menthol smokers (vs. non-menthol smokers), non-daily smokers (vs. daily smokers), and less nicotine dependent smokers (vs. high nicotine dependence) were more likely to attempt to quit smoking. We did not find an association between the use of flavors and any smoking cessation outcome. **Conclusion:** Among cigarette and e-cigarette dual users, the type of e-cigarette device, frequency of e-cigarette and cigarette use, and cigarette nicotine dependence were associated with cigarette cessation behaviors. Our analyses identify patterns of use associated with smoking cessation behaviors, but need to be corroborated by longitudinal studies.

FUNDING: Federal

PH-250

SOCIAL FACTORS AND CHANGES IN PATTERNS OF TOBACCO USE IN DUAL USERS OF CIGARETTES AND ENDS

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Significance: Social factors such as partner and family tobacco use, and time spent around other users, can influence behavior and changes regarding both cigarette and ENDS use. Further understanding of these relationships in the context of using multiple products, which is increasingly prevalent, can help guide interventions. **Methods:** Data are from 364 adult smokers who also used ENDS (41% female; 38% White; mean age 35). Participants completed questionnaires at baseline and 12 months, as well as biweekly surveys on nicotine product use. There were no inclusion criteria for wanting to stop smoking. **Results:** At baseline, 32.2% of participants had partners who smoked, 24.6% had non-smoking partners, and 43.2% did not have partners. Cigarettes per day at baseline ($F(2,361)=3.36$, $p=0.036$) and 12 months ($F(2,361)=6.07$, $p=0.003$) was highest among those partnered with smokers. Frequency of ENDS use at baseline ($F(2,361)=3.96$, $p=0.020$) and 12 months ($F(2,361)=5.17$, $p=0.006$) was highest among those partnered with non-smokers. Motivation ($F(2,360)=3.92$, $p=0.021$) and confidence ($F(2,356)=5.40$, $p=0.005$) in quitting were lowest among participants with smoking partners. Those with non-smoking partners (OR=3.68, 95%CI=1.58-9.34, $p=0.004$) or no partner (OR=3.55, 95%CI=1.64-8.57, $p=0.002$) were more likely to have quit smoking 12 months later (past 30 days abstinence) than those with smoking partners, but only those with non-smoking partners were more likely to report making a quit attempt (OR=2.04, 95%CI=1.11-3.82, $p=0.023$). Self-reported time spent with smokers in the past week predicted lower odds of cessation (OR=0.43, 95%CI=0.24-0.76, $p=0.003$), but not quit attempts; while being encouraged by close acquaintances to quit in the past year predicted making a quit attempt (OR=2.37, 95%CI=1.33-4.25, $p=0.003$), but not cessation. Of note, baseline partner ENDS use status was not associated with significant differences in any of the above measures. **Conclusions:** Among dual users, partner smoking significantly impacts cigarette and ENDS use patterns, while partner ENDS use has minimal influence. Along with other social influences, these are important considerations for interventions.

FUNDING: Federal

PH-251

WHAT'S SOCIAL MEDIA TELLING US ABOUT THE TOBACCO PRODUCT LANDSCAPE

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Significance: The tobacco product landscape in the United States has evolved to include emerging products. For example, new types of e-cigarette have recently emerged in the U.S. market, and in 2019, the U.S. Food and Drug Administration approved the sale of IQOS, a heated tobacco product (HTP), in the U.S. Collecting information rapidly, such as through social media, can provide timely data to monitor emerging products and consumers' interest in them. **Methods:** We collected data through social media on e-cigarettes and HTPs from Twitter and YouTube during 2018-2020 using the following search terms for e-cigarettes: "e-cig," "ecig," "vape," or "vaping" and the following search terms for HTPs: "nicotine" or "tobacco." For Twitter, posts were classified as being from either a commercial or non-commercial source. For YouTube, channels with 1,000 or more subscribers that reviewed e-cigarette and HTP products were examined. Content and descriptive analyses of both the Twitter and YouTube data were conducted to identify prominent brands/products mentioned and changes over time. **Results:** During 2018-2020, JUUL, a cartridge-based e-cigarette, was the most commonly mentioned e-cigarette brand on Twitter, but mentions started decreasing over time beginning in October 2019. Smok, Logic, Geekvape, and Vooipo were other commonly mentioned brands and products, with mentions fluctuating across years. Mentions of disposable e-cigarette brands, including Puff Bars, emerged in 2019 and increased in 2020. Mentions of HTPs on Twitter were low during 2018; however, there was an increase during mid-2019 which appeared to be driven by mentions of IQOS, followed by a late 2019 decrease and a subsequent increase in early 2020. On YouTube, Smok and Geekvape e-cigarette brands and products were the most commonly reviewed, while Glo and IQOS were the most commonly reviewed HTPs. **Conclusion:** Social media data can provide insight into which tobacco products and brands are being promoted, and which are currently trending among consumers. As consumer interests change, these data can help inform timely tobacco prevention and control efforts.

FUNDING: Federal



PH-252

CURRENT TOBACCO USE AND LEARNING ABOUT THE HARMS OF TOBACCO IN SCHOOL AMONG ADOLESCENTS AGED 13-15 YEARS IN 12 COUNTRIES: FINDINGS FROM THE GLOBAL YOUTH TOBACCO SURVEY

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SIGNIFICANCE: Globally, about 12%, or nearly 44 million, of adolescents aged 13-15 who attend school use one or more forms of tobacco. Prevalence of current tobacco use is higher among boys compared to girls, and in low- and middle-income countries compared to high-income countries. This study examined the prevalence of current tobacco use and learning about the harms of tobacco use in schools among adolescents aged 13-15 in 12 countries from 2012-2019. **METHODS:** The Global Youth Tobacco Survey (GYTS) is a nationally representative, school-based survey of adolescents aged 13-15 years. Sample sizes for the pooled data ranged from 1,639 (Fiji) to 7,176 (Gambia); response rates ranged from 77.0% (Costa Rica) to 97.9% (Azerbaijan). Current tobacco use was defined as using any smoked and/or smokeless tobacco product in the past 30 days. We analyzed data from four questions related to learning about the harms of tobacco use in school during the past 12 months. Point estimates and multivariate logistic regression was used to assess prevalence and predictors of reported learning about the harms of tobacco. **RESULTS:** Prevalence of current tobacco use among adolescents ranged from 8.4% in Azerbaijan to 22.4% in Lithuania. Prevalence of methods of learning about the harms of tobacco use were: being taught about dangers of tobacco in class (range: 44.2%-69.3%); reading in text books about health effects of tobacco use (range: 38.4%-76.4%); discussing reasons in class why adolescents use tobacco (range: 22.0%-51.2%); and being taught about specific negative health effects of tobacco use (range: 37.2%-63.5%). After adjusting for country, age, and sex, discussing reasons why adolescents use tobacco was associated with higher odds of current tobacco use (OR=1.33; 95% CI:1.11-1.61). The other three questions were not significantly associated with current tobacco use. **CONCLUSION:** The prevalence of current tobacco use and learning about the harms of tobacco use in schools varied across the 12 assessed countries. Opportunities exist to enhance the provision of tobacco prevention education in schools, and to evaluate the impact of different educational approaches in this setting.

FUNDING: Federal

PH-253

WHERE VAPERS PURCHASED THEIR VAPING PRODUCTS - FINDINGS FROM THE 2016-2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEYS

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Significance This study describes vapers' preferred locations to purchase nicotine vaping products (NVPs), and how the preference varies by country, time (year), and social networks. **Methods** Data came from vapers who used NVPs at least weekly in 2016 (Wave 1, n=1921), and 2018 (Wave 2, n=4200 including 1695 Wave 1 vapers) surveyed as part of the ITC 4CV Survey conducted in Australia (AUS), Canada (CA), England (EN) and the United States (US). At each survey wave, the vapers were asked where they purchased their vaping products (online, vape shop, and "other retail locations" (e.g., supermarkets, petrol stations, convenience shop)), the vaping behaviors of themselves, their partner and their social networks. **Results** Across the four countries, from 2016 to 2018, similar percentages of vapers bought their NVPs online in both years (25% in 2016, 24% in 2018). Vapers from AUS were more likely to purchase online (over 45% in both years) compared to vapers in the other countries. Overall, across the four countries purchasing from vape shops decreased from 41.8% in 2016 to 33% in 2018 whereas purchasing from "other retail locations" increased from 33.5% to 43.2%, largely due to changes in CA and EN. In CA, the "other retail locations" rose from 25.4% to 35.9% between 2016 and 2018, at the expense of vape shops (59.1% to 48.4%); in EN, the "other retail locations" increased from 35.4% to 47.7% primarily due to a reduction in purchasing online (30.7% to 22.7%) and in vape shops (33.9% to 29.6%). Purchasing locations reported by vapers in AUS and the US did not change substantially between 2016 and 2018. In US (but not in other countries), those living with a vaping partner were more likely to buy NVPs from vape shops compared to those without a vaping partner (43.1% vs. 32.7%, aOR=2.03, 95%CI 1.30-3.17, p=0.002), as were those who had at least 1 vaping friend compared with those without (39.7% vs. 30.7%, aOR=1.64, 95%CI 1.11-2.43, p=0.01). **Conclusion** As might be expected, patterns of purchasing vaping

supplies appear to be at least partly determined by availability of sources, which appears to be influenced by regulatory policies. As vaping becomes more socially normalised, the role of traditional retail outlets appears to increase.

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

PH-254

PATTERNS OF TOBACCO POLY-USE IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2017: A MULTISTATE MARKOV TRANSITION ANALYSIS

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Significance: As tobacco product use patterns change, it is important to understand transition rates between single, dual, and poly tobacco product use categories over time to help identify areas for policy intervention. **Methods:** Transition rates between never, non-current (i.e., 30-day abstinence), cigarette, e-cigarette, other combustible, smokeless tobacco (SLT), dual, and poly-use states (defined by current everyday or someday use) in adults were estimated under a multistate Markov model framework using Waves 1-4 (2013-17) of the Population Assessment of Tobacco and Health (PATH) study, accounting for complex study design. **Results:** Sole cigarette or SLT use was persistent, with 77% and 78% of users remaining users after one wave, respectively. Other use states were more transient, with 29-48% of users reporting the same use pattern after one wave (48% sole other combustible, 47% sole e-cigarette, 39% dual cigarette and SLT, 36% dual cigarette and other combustible, 32% poly with cigarette, 30% dual cigarette and e-cigarette, and 29% dual or poly without cigarette). If single-product users transitioned, it was most likely to non-current use. If dual or poly cigarette users transitioned, it was most likely to sole cigarette use (cigarette and e-cigarette: 46% (95%CI 46-47); cigarette and other combustible: 38% (95%CI 37-41); cigarette and SLT: 26% (95%CI 23-33); poly-user with cigarette: 21% (95%CI 17-27)). Transitions from dual or poly-use without cigarettes varied, with high probabilities of transitioning to a sole non-cigarette product (36% (95%CI 34-37)) or to non-current (19% (95%CI 18-15)) use. **Conclusions:** Dual and poly-use categories are largely transient, while single-use categories are more stable over time. Transitions out of dual and poly cigarette use were most likely to be to cigarettes alone, while transitions out of dual or poly-use without cigarettes were most likely to be to sole non-cigarette product use or non-current use.

FUNDING: Federal

PH-255

VAPING AND SUBSEQUENT SMOKING EXPERIMENTATION AMONG CANADIAN YOUTH AND YOUNG ADULTS

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Significance: There has been strong evidence in favor of a longitudinal effect of e-cigarette use (vaping) on smoking among never smoking youth and young adults, but limited insights are available on whether vaping, especially frequent vaping, would generate differential impact by levels of smoking susceptibility. Hence, we tested the association of baseline regular vaping (past-month weekly vaping) and 1-year smoking experimentation and assessed if this association differed by baseline smoking susceptibility. **Methods:** In this prospective cohort study, Canadians aged 16-26 years were recruited and surveyed online in February and March 2018 (baseline) and at the 1-year follow-up. Analysis was conducted on baseline self-reported never smokers who were followed up a year later (n=346/524, response rate=66.0%). A logistic model was used to assess the relationship between baseline regular vaping and 1-year smoking experimentation, adjusting for baseline smoking susceptibility and its interaction with regular vaping, as well as age, sex, race, sensation seeking, tobacco use and having smoking friends. **Results:** Among 346 baseline never smokers, 41.6% were female, 76.0% were Caucasian, and the mean age was 17.9 (standard deviation, 2.1) years. At 1-year follow-up, 77 (22.3%) had experimented with smoking. Baseline regular vaping was associated with greater increase in the odds of 1-year smoking experimentation among baseline non-susceptible individuals (odds ratio, 4.55, 95% CI, 2.03 to 10.19) than it was among baseline susceptible individuals (odds ratio, 1.55, 95% CI, 1.01 to 3.42). On the probability scale, baseline regular vaping increased the marginal probability of 1-year smoking experimentation from 3% (95% CI, 1% to 8%) to 13% (95% CI, 5% to 29%) for non-susceptible individuals and from 12% (95% CI, 5% to 27%) to 18% (95% CI, 7% to 38%) for their susceptible counterparts. **Conclusion:** Vaping is



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associated with later smoking experimentation among youth and young adults and the effect is more prominent among those at lower risk of smoking. These results highlight an urgent need for stringent regulations on vaping products to prevent an upswing in the uptake of smoking among young people.

FUNDING: Nonprofit grant funding entity

PH-256

ARE ADOLESCENT RESILIENCE, FAMILY AND SCHOOL ENVIRONMENTAL FACTORS ASSOCIATED WITH ADOLESCENT INTENTION TO USE TOBACCO IN INDIA

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Background: Early adolescence is a crucial developmental period. It is a time when adolescent start to increasing become more independent, forge new relationships, develop new social skills and experiment with new behaviors like tobacco use. Prevalence of any form of tobacco use is 14% among school going adolescents in India. **Objective:** To assess associations between intention to use tobacco among adolescents and resilience score, family cohesion score, parent monitoring score, school connectedness score and teacher monitoring score. **Methods:** We used data from a population-based household survey (2018-2019) of young adolescents (12-14 years, n=1982) and their parents/main-caregivers living in Kolkata (n=1038) and Mumbai (n=944) India. Participants completed questionnaires about tobacco use, intention to tobacco use, resilience, family, parental and school factors. Scores were developed for adolescent resilience score (0-10), family cohesion score (0-5), parent monitoring score (0-6), school connectedness score (0-4) and teacher monitoring score (0-6). We used weighted multivariable logistic regression with intention to use tobacco as the outcome. **Result:** Tobacco use among adolescence was too low to be analysed (Mumbai=0.4%, Kolkata=0.2%). Adolescent's intention to use tobacco was higher in Mumbai (8.5%) than in Kolkata (7.7%). Boys from both cities reported higher intention to use tobacco than girls. Multivariable weighted logistic regression analysis shows adolescence's resilience, family cohesion, parent monitoring, school connectedness and teacher monitoring were independently associated with adolescent intention to use tobacco in Mumbai but was not in Kolkata. **Conclusion:** Adolescent resilience, family cohesion, parent monitoring, school connectedness and teacher monitoring factors plays important role in adolescent intention to use tobacco. Therefore, policy makers should consider these factors during adolescence as an additional tobacco control measures in India.

FUNDING: Federal

PH-257

DETERMINING THE SOURCE OF TOXIC HEAVY METALS IN CLOSED SYSTEM ELECTRONIC CIGARETTES, A PILOT STUDY

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Background: Potential toxicants emitted from e-cigarettes (ENDS) include various types of heavy metals, such as lead, nickel, chromium, and cadmium, all of which are associated with a variety of health risks, including cancer. Previous research has also shown that these metals do not originate from the refill solution itself, instead they may be leeching into the solution over time from the individual parts of the ENDS device. However, extensive research has not been performed to identify the specific sources of heavy metals in ENDS, which this study aims to determine. **Methods:** A pre-filled ENDS device from the International Tobacco Control (ITC) 4-country survey was selected to pilot this study based on high levels of lead previously detected in its refill solution. This device was a Blu Plus cartridge, not connected to a battery, and was purchased in 2017 from England. This device was deconstructed into its individual assembly components, then washed and sonicated using methanol. Each component was then submerged separately in 10 mL of a blank 50/50 PG/VG in 5% water mixture. One milliliter samples were taken at time: 0, 2 weeks, 1 month, 3 months, and 6 months and tested for levels of lead, nickel, chromium, and cadmium using atomic absorption spectroscopy. **Results:** Nickel, chromium and cadmium were not identified at quantifiable levels during any timepoint, for any component. One component, a metallic connection between the device's atomizer and its battery, was found to be a significant source of lead, which was detected with increasing concentration at each sampling time point. Other components of the ENDS device, including the coil, refill solution reservoir, and device casing among others, also showed an increasing signal for lead between sampling time points;

however, these results were below our limit of quantitation. **Conclusions:** This study has identified components of ENDS devices that are significant sources of toxic lead. It also sets the groundwork for more extensive heavy metal contamination studies on a diverse range of ENDS products in the future.

FUNDING: Federal

PH-258

USING MENTHOL CIGARETTES AND MENTHOL E-CIGARETTE LIQUIDS ARE ASSOCIATED WITH PAST-MONTH MARIJUANA USE AMONG HIGH SCHOOL ADOLESCENTS

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Significance: Adolescent cigarette use, especially menthol cigarette use, is associated with marijuana (MJ) use. It is unknown whether this relationship holds for menthol e-cigarette (e-cig) use. We examined relationships between past-month (PM) cigarette, e-cig, and MJ use among high school adolescents and whether menthol cigarette or e-cig use increased risk for MJ use in the past month. **Methods:** In 2019, 4,875 students from 6 Connecticut high schools completed a school-based survey (51.6% female, 44.1% Non-Hispanic White, 16.00[1.30] years old). We examined rates of PM e-cig, cigarette, and MJ use and ran a binary logistic regression to evaluate if PM cigarette use (none, menthol, or non-menthol/regular) and/or PM e-cig use (none, use of menthol e-liquid, or use of non-menthol e-liquids) was associated with MJ use in the past month. We controlled for school, age, sex, race (non-Hispanic White [reference group], non-Hispanic black, Hispanic, and other), and PM use of cigars, cigarillos, and hookah. **Results:** PM use rates were 29.7% for e-cigs (11.1% of whom used menthol), 2.6% for cigarettes (37.3% of whom used menthol), and 22.2% for MJ. Compared to youth who did not smoke or vape, respectively, those who smoked non-menthol cigarettes (OR = 2.01) or vaped non-menthol e-liquids (OR = 28.18) were more likely to use MJ. Risk for MJ use was elevated further among those using menthol cigarettes (vs. non-menthol cigarettes [OR = 13.31]; vs. no use [OR = 26.81]) or menthol e-liquids (vs. non-menthol e-liquids [OR = 2.03]; vs. no use [OR = 57.06]). Being older (OR = 1.22), non-Hispanic Black (OR = 2.43), and PM hookah use (OR = 3.51) also conferred risk for PM marijuana use. **Conclusions:** After accounting for demographics and other combustible tobacco use, PM cigarette and e-cig use were associated with MJ use among adolescents, with higher odds of MJ use observed among those using menthol products. The findings raise additional concerns about the continued availability of menthol cigarettes and mentholated e-liquids in US markets. Future research is needed to examine specific patterns of use of menthol products and MJ (e.g., separate use, co-use, co-administration) in youth.

FUNDING: Federal; Academic Institution

PH-259

SOCIO-DEMOGRAPHIC CORRELATES OF WATER-PIPE SMOKING IN SOUTH AFRICA DURING 2017-2018: FINDINGS FROM A NATIONAL HOUSEHOLD SURVEY

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Significance: Despite the known harm associated with water-pipe smoking, only limited information is available on the national prevalence of water-pipe smoking and the profile of water-pipe smokers in South Africa. This study therefore sought to determine the prevalence and the socio-demographic correlates of water-pipe smoking in a nationally representative sample of South African adults. **Methods:** This study involved the analysis of the pooled data from the 2017 and 2018 South African Social Attitude Survey (SASAS) (n=5700). The SASAS is a nationally representative sample of South African adults, 16 years and older. Data obtained among others, included participants' socio-demographic profile, factory-manufactured cigarette use, water-pipe smoking and use of other tobacco products. Current water-pipe smokers are those who smoke water-pipe every day or someday. Analysis included chi-square and multi-variable adjusted logistic regression. **Results:** The prevalence of water-pipe smoking was 3.6% (95% CI: 2.8-4.6) and there was no significant difference between 2017 and 2018 (3.1% vs. 4.1%; p=0.264). Of the water-pipe smokers, 61% (n=103), also smoked factory-manufactured cigarettes. In a bivariate analysis, water-pipe smoking was more common among those younger than 35 years than those older (5.6% vs. 1.6%; p<0.01) and more common among males than females (5.5% vs. 1.7%; p<0.001). Similarly, cigarette smoking was more common among males than females (30.2% vs. 9.6%; p<0.01). However, in a logistic regression model, controlling for current cigarette smoking, being female was no longer significantly associated with water-pipe smoking (OR= 0.553; 95%CI: 0.289-1.060), but younger



age (OR=4.390; 2.488-7.747) and higher than high school education (OR=2.865; 1.349-6.081) remained associated with significantly higher odds of water-pipe smoking. **Conclusion:** Water-pipe smoking seems to be transcending the gender norm associated with factory-manufactured cigarette smoking, particularly among younger South African adults. The study findings highlight the need for regulation of water-pipe smoking and targeted prevention and cessation support for younger adults in South Africa.

PH-260

INCIDENCE OF CARDIOVASCULAR OUTCOMES AMONG CIGARETTE AND ENDS USERS IN WAVES 1 THROUGH 5 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2019

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Cigarette smoking is a major cause of cardiovascular disease; however, prior studies have not clearly established what risk ENDS pose to cardiovascular health after smokers switch to their exclusive use. We aim to fill this gap using PATH Study data to examine the incidence of cardiovascular disease among cigarette smokers, ENDS users and former smokers, compared to lifetime never-users. This study analyzes 5 waves of PATH Study data, beginning with Wave 1 (2013-2014) through Wave 5 (2018-2019). Analyses are conducted over 3 three-year time survey intervals (Waves 1 to 3; Waves 2 to 4, Waves 3 to 5) and are restricted to adults age 40 years and over at baseline who did not report a history of cardiovascular disease for the first two years. Change in tobacco use status between the first two years was used to predict onset of cardiovascular disease between the second and third years in each interval. Tobacco use categories considered were: 1) continued cigarette smoking (past 30-day smokers at each wave, P30D); 2) switching to exclusive P30D ENDS use; 3) switching to dual P30D use of cigarettes and ENDS; 4) quitting all use of tobacco; and 5) continuing never use of tobacco. Additional sensitivity analyses will be explored. Cardiovascular disease incidence was defined as a new self-report of a PATH Study participant being told by a doctor or other health professional that they had congestive heart failure, stroke, or heart attack during the indicated intervals. Preliminary results from the 3 three-year sets of data were aggregated and weighted; generalized estimating equation (GEE) analyses were performed on 10,911 observations from 3,637 persons who were free of cardiac disease at baseline. Cardiovascular disease risk factors including age, history of high blood pressure, elevated cholesterol, diabetes, family history of premature heart disease, and elevated body mass (BMI) will be described by tobacco use group to assess relevant differences between those who quit using all tobacco and those switching to exclusive or dual use of ENDS. Differences in cardiovascular disease risk by tobacco use pattern, adjusting for potential confounders, will be reported.

FUNDING: Federal

PH-261

DEMOGRAPHIC CHARACTERISTICS ASSOCIATED WITH HIGH RATES OF VAPING AND JUUL USE AMONG YOUNG ADULTS

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Significant progress has been made in reducing combustible tobacco use among young adults. However, with a recent increase in use of newer tobacco products like JUUL, this trend is threatened to be reversed. The demographic subgroups most at risk for combustible cigarette use may not be the same subgroups most at risk for vaping. Understanding the groups most at risk of initiating nicotine use with vapes is important for prevention and regulation. This study examined current (past 30-day) vaping, JUUL use, and combustible cigarette use among young adults aged 18-24 over a two-year period (July 2018- July 2020). Data were from a national continuous tracking survey, with daily surveys conducted among 140 participants per week. Demographic and psychosocial characteristics known to be associated with higher rates of combustible cigarette use were examined including high sensation seeking, low socioeconomic sta-

tus, identifying as LGBTQ, or belonging to a racial/ethnic minority, to determine if these characteristics were similarly associated with higher rates of JUUL use and/or vaping. Results indicated some demographic characteristics were associated with both higher combustible tobacco use and higher vape use including young adults who identify as high sensation seekers, LGBTQ, or male. However, there were some important differences between groups with high rates of vaping or JUUL use compared to groups with high rates of smoking. Notably, there were significantly more current vapers (26%) and JUUL users (19%) among those who were currently enrolled in college compared to their same-age non-enrolled peers (24% and 15% respectively, $Z>2.84$, $p<.001$). This is in contrast to the smoking rate which was lower among the college enrolled (28%) than the non-enrolled (32%, $Z=4.8$, $p<.001$). Similarly, the smoking rate was higher among non-white young adults (32% for non-white vs. 30% for white; $Z=2.93$, $p<.01$) but the rate of JUUL use was higher among non-Hispanic whites (19% for non-Hispanic whites vs. 15% for Hispanic whites, $z=6.44$, $p=0$). Results can inform counter-marketing campaigns and potential marketing restrictions for young adult populations as well as college campus policy makers.

PH-262

EXAMINING CIGARETTE DISCONTINUATION AMONG A COHORT OF MENTHOL AND NON-MENTHOL CIGARETTE USERS IN THE US

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SIGNIFICANCE: Despite the increased prevalence of menthol cigarette use in the US, there is still conflicting evidence whether menthol cigarette use is associated with smoking cessation, especially among different sociodemographic groups. This study examines the association between menthol flavoring and discontinued cigarette use over three time periods, and tests for differences in the association by age, sex, and race/ethnicity. **METHODS:** We used nationally representative data from the Population Assessment of Tobacco and Health (PATH) study to estimate patterns of discontinued cigarette use among adult respondents who were current established smokers at baseline ($n=11,290$). A series of weighted multivariable logistic regression models examined the association between menthol flavoring and discontinued cigarette use over three time periods (W1-W2; W1-W3; W1-W4), controlling for cigarette frequency and intensity. Effect modification by age, sex, and race/ethnicity was assessed by examining the statistical significance of interaction terms, in separate models. **RESULTS:** Among established US adult cigarette smokers, there were no statistically significant differences between menthol flavoring and discontinued cigarette use across any of the time periods. In addition, none of the interaction terms were statistically significant. However, we found that the odds of discontinued use were consistently lower for females, non-Hispanic Black individuals, and people with lower levels of educational attainment. **CONCLUSIONS:** Menthol cigarette flavoring at baseline was not associated with discontinued tobacco use at any of the follow-up time points. The results from this study suggest that disparities in discontinued use operate in a similar way for both menthol and non-menthol cigarette smokers. These findings reinforce the need to examine disparities in cigarette use discontinuation, regardless of flavoring.

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

PH-263

ATTITUDES AND BEHAVIORS OF SNUFF USE AND CESSATION AMONG PEOPLE WITH AND WITHOUT HIV IN MATLOSANA, SOUTH AFRICA

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Significance. We previously reported a high (48%) prevalence of snuff use - a dry nasal form of tobacco - among non-smoking women living with HIV in Matlosana, South Africa. Little is known of the attitudes and behaviors of use, strategies for cessation, and potential health risks. **Methods.** To fill this knowledge gap, we recruited HIV infected (HIV+) and uninfected (HIV-) adult (≥ 18 years) self-reported current snuff users from clinics in Matlosana. Participants were administered a questionnaire to collect information on demographics, snuff use and cessation attempts, preferred strategies for cessation, other substance use, history of respiratory illness, and mental health. **Results.** In total, 150 (74 HIV+, 76 HIV-) participants were recruited. Of all participants, 115 (77%) were daily users with a median (IQR) of 11.5 (3.5, 23.0) years of use; 6 (4%) were current smokers



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and 17 (11%) former smokers, and no other nicotine use was reported. Regardless of HIV status, top reasons for current snuff use included improving health (n=48, 32%), reducing stress (n=26, 16%), and "being a habit" (n=38, 25%). Participants believed snuff use to have mostly positive (n=68, 46%) or no (n=54, 36%) health impacts, with 57 (38%) participants stating snuff use cures headaches. Among all participants, 103 (69%) previously attempted and failed to quit snuff use. Despite this, 110 (73%) participants indicated high interest in quitting snuff. Although 105 (70%) participants indicated that advice from a healthcare provider would aid them in quitting snuff, only 30 (20%) reported ever receiving that advice. A majority of participants (n = 141, 94%) suffer from moderate to high levels of perceived stress, which may be a key barrier to successful cessation. **Conclusions.** Education on negative impacts of snuff, advice to quit from healthcare providers, and nicotine replacement therapy to gradually reduce habitual snuff use should all be considered in the development of a cessation program.

FUNDING: Academic Institution

PH-264

FLAVORING PATTERNS OF EXCLUSIVE AND DUAL-USE OF CIGARETTES AND E-CIGARETTES AMONG US ADULTS. RESULTS FROM THE TUS-CPS 2018-2019

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Significance: Until recently, there has been little data to characterize flavors for both cigarettes and e-cigarettes. This study aims to explore the flavoring patterns of exclusive and dual-use of cigarettes and e-cigarette use among US adults. **Methods:** We analyzed the 2018-19 Tobacco Use Supplement to the Current Population Survey. Our sample consisted of 16,757 exclusive and dual users of cigarettes and e-cigarettes. We combined information on menthol cigarettes (menthol and non-menthol) and e-cigarettes flavors (menthol, tobacco, spice/sweet, and other) to generate a 14-category variable on flavorings for exclusive and dual-use of cigarettes and e-cigarettes. We estimated the proportion and 95% confidence intervals of flavoring use by sex, age group, race/ethnicity, income, and education. **Results:** Non-Hispanic (NH) Blacks were the racial/ethnic group with the highest proportion of exclusive menthol cigarette use (69% vs. 28% for NH Other race/ethnicity, 27% for Hispanics, and 18% for NH Whites). Females were more likely to exclusively use menthol cigarettes than males (31.2% vs. 22.4%). Young adults aged 18-35 (7.1%) vs. adults aged 36 and over (3.6%), and adults with a college degree or more (4.2%) vs. less than high school (1.7%) had a higher proportion of exclusive menthol e-cigarette use. NH Blacks were the racial/ethnic group with the lowest proportion of exclusive menthol e-cigarette use (1.0%). The proportion of exclusive e-cigarette use with sweet/spicy flavor was higher among young adults aged 18-35 (10.3%) vs. adults aged 36 or older (2.8%), and among adults with a college degree or more (7.2%) vs. less than high school (2.2%). The dual-use of menthol cigarettes with sweet/spicy e-cigarettes was higher among young adults than adults over 35 years (1.7% vs. 0.4%). **Conclusions:** NH Blacks were the racial/ethnic group with the highest proportion of exclusive menthol cigarette use, but the lowest of exclusive menthol e-cigarette use. Exclusive and dual-use of menthol and sweet/spicy e-cigarettes was higher among young adults than adults over 35 years. These findings are relevant to understand which populations would be most affected by flavoring restrictions.

FUNDING: Federal

PH-266

SMOKELESS TOBACCO USE AND CARDIOVASCULAR DISEASE RISK: INSIGHTS FROM THE 2013-2014 POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: In the U.S., smokeless tobacco (ST) use has been stable across recent years. Nationally represented data from the Population Assessment of Tobacco and Health (PATH) Study (2013-2014) show that 1.6% of youth and 3.4% adults reported current ST use. Smokeless tobacco use has been shown to deliver high doses of nicotine but without the combustion products found in cigarette smoke. Combustible tobacco smoking is strongly associated with the development of cardiovascular disease (CVD), but little is known about ST use and current available data have been inconsistent. **Methods:** We examined levels of CVD disease diagnosis and CVD-related exposure and effect biomarkers among exclusive ST product users (n=338) who report recent use in the last 2 days, compared with exclusive cigarette smokers (n=3034) and never tobacco users (n=975), using data from a nationally representative sample of adults from the PATH Study (2013-2014). **Results:** Approximately half (47.2%) of ST users,

40.4% of cigarette smokers and 34.7% of never smokers reported having a diagnosis of CVD. Among participants who do not report history of CVD, inflammatory biomarkers interleukin-6 (IL-6), intercellular adhesion molecule (sICAM), fibrinogen and oxidative stress biomarker 8-isoprostane were significantly lower among ST users compared to cigarette smokers (all P<0.05; adjusting for age, gender, ethnicity, income and BMI), but similar to never smokers (P=ns). Compared to cigarette smokers, urine concentrations of cotinine and nicotine were significantly higher among ST users (both P<0.05). ST users who were former established cigarette smokers (n=130) have lower levels inflammatory (high sensitivity C-Reactive-Protein, sICAM, fibrinogen) and oxidative (8-isoprostane) biomarkers, compared to cigarettes users (P<0.05), despite having higher levels of nicotine and cotinine (P<0.05). **Conclusions:** Among exclusive ST users, ST use is not associated with increases in biomarkers of inflammation and oxidative stress compared to never smokers, despite exposure to nicotine levels comparable to those of cigarette smokers. These findings suggest that increases in CVD risk among cigarette smokers is caused primarily by constituents of tobacco smoke other than nicotine.

FUNDING: Unfunded

PH-267

A COMPARISON OF THREE DIFFERENT FREQUENCY MEASURES OF NICOTINE DELIVERY PRODUCTS

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Introduction. With the increasing use of non-cigarette tobacco and nicotine products alone and in combination, the definition of "current use" measurement may have important implications for monitoring use patterns at the population level. **Methods.** Using adult data from three nationally representative US surveys (2014/15 TUS-CPS, NHIS and PATH), we compared the estimated prevalence of four product groups (cigarettes, other combustibles, smokeless tobacco and e-cigarettes) based on three past 30 days frequency use thresholds: 1 or more, 10 or more and 25 or more days. In addition, we confined current cigarette use to those using at least 100 cigarettes in their lifetime. We also examined mutually exclusive proportions of single, dual (two products), and poly (three or more products) users as a percentage of total users for each of the four products groups for each survey. Analyses were stratified by gender (male and female) and age groups (18-34 and 35 and over years). **Results.** When comparing across surveys, we found that, regardless of threshold or product, the prevalence was highest in PATH followed by NHIS and TUS-CPS. Prevalence estimates were particularly sensitive to the frequency measure among younger adults especially for the 1+ and 10+ days thresholds. Any use prevalence estimates based on the three thresholds changed the least for cigarettes and the most for other-combustible products. The proportion of exclusive product use among any users was the highest among cigarette and smokeless tobacco with relevant increases associated with the increase in threshold. E-cigarette users showed the highest proportion of dual use among all products. The frequency of dual and poly tobacco use for all products decreased the most when comparing the 1 or more days to the 10 or more days thresholds. Polyuse was almost non-existent when using the 25 or more days threshold. **Conclusion.** The prevalence of overall and dual use varied considerably depending on the survey and frequency use measure adopted. Depending on their specific goal, researchers should carefully consider which threshold should be adopted when defining current use and how it may be influenced by the survey design.

FUNDING: Federal

PH-268

CHARACTERISTICS OF U.S. ADULTS BY CIGARETTE SMOKING STATUS, HOUSING TYPE, AND TENURE — UNITED STATES, 2019

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Significance: Multi-unit housing (MUH) residents may be at a higher risk for secondhand smoke exposure than those who live in single-family housing. However, data regarding characteristics of cigarette smoking status, by housing type and tenure, are limited. This



study examined the prevalence and sociodemographic characteristics of U.S. adults by cigarette smoking status and by housing type and tenure. **Methods:** Data from the Current Population Survey (CPS) March 2019 Annual Social and Economic Supplement (ASEC) were merged with January and May 2019 waves of the CPS Tobacco Use Supplement (TUS) (n=40,956). Both the ASEC and TUS are nationally-representative, household-based surveys. Prevalence estimates of current (past 30-day) cigarette smoking status among adults aged ≥ 18 years were examined by housing type (single-unit or multi-unit) and housing tenure (public, private rented, private owned). Current smoking status by housing type was further stratified by metropolitan status, sex, race/ethnicity, employment status, occupational category, age, annual household income, and Census region. Weighted bivariate analyses and chi-squared tests were conducted to assess differences between groups. **Results:** Approximately one-quarter (27.0%) of current adult smokers lived in MUH. The prevalence of current smoking was 19.5% among residents of public MUH, 11.0% among residents of privately-rented MUH, and 7.4% among residents of privately-owned MUH ($p < 0.001$). Among MUH residents (private or public) who were current smokers, the highest prevalence by sociodemographic groups were: those living in metropolitan areas (91.3%), men (55%), non-Hispanic whites (54.2%), those not currently in the labor force (39.7%), those aged ≥ 55 years (36.2%), those with an annual household income $< \$20,000$ (34.0%), and those living in the South (31.3%). **Conclusion:** Smoking among residents of MUH, especially given the higher prevalence among those in publicly-owned dwellings, may put MUH residents at a higher risk for involuntary secondhand smoke exposure. These data can inform efforts to promote smoking cessation and smokefree policy adoption in MUH.

FUNDING: Federal

PH-269

THE ROLE OF TIME-DISCOUNTING AND SMOKING DEPENDENCE IN SUSTAINED QUITTING

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Significance Time-discounting may be crucial to understand successful quitting, since smokers who more greatly value immediate reward may be less likely to quit. Little is known, however, about the role of discounting in Mexico, where most smokers are light smokers, and its combined effect with smoking dependence. **Methods** Data came from an online cohort of adult Mexican smokers, surveyed five times between November 2018 and March 2020. We used two analytic samples. The first sample included all smokers who completed at least two consecutive waves (n=2546) and was employed to assess within-individual consistency of discount rates based on non-parametric correlations. The second sample was further restricted to those who attempted quitting between waves (n=996) and was employed in logistic models that regressed sustained quit attempts at time t+1 on future discounting, smoking dependence, and controls at time t. Sustained quit attempts were defined as those that lasted 30 days or more. Time-discounting was measured with a 31-question module that presented a hypothetical monetary reward scenario. Specifically, scores reflecting choices were assigned to define the discount rate. Smoking dependence was assessed with a multidimensional indicator based on a 10-item subset of the 68-item Wisconsin Inventory of Smoking Dependence (WISDM). As interitem correlations were high (Cronbach's $\alpha = 0.92$), we averaged the standardized scores for all the items to create a continuous index. Other controls included age, sex, education, income, fixed effects by wave, and time in the sample. **Results** Spearman's correlations indicated that discount rates across subsequent waves are significant but rather weak ($\rho = [0.4, 0.55]$; $p < 0.01$), especially since future discounting is not expected to change in the short run. Multivariate models found no association between discount rates and sustained quit attempts (AOR=0.997) but suggest that the modified WISDM dependence indicator is a strong predictor of quit attempts (AOR=0.568; $p < 0.01$). **Conclusions** Psychological dependence appears appropriate to understand sustained quit attempts in a context of relatively light smoking. Time-discounting is less promising for predicting cessation success; however, our results are not conclusive since the internal validity of the discounting indicator was not strong. Future studies should explore other measures of discounting among smokers.

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PH-270

GENE-ENVIRONMENT CORRELATIONS FOR CENSUS TRACT-LEVEL CIGARETTE SMOKING DURING PREGNANCY AND RELATED NEIGHBORHOOD MEASURES

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Introduction: We examined gene-environment correlations, and family-of-origin environmental influences, on residential neighborhood characteristics in adulthood, for census tract-level rates of cigarette smoking during pregnancy, teen pregnancy, and neighborhood sociodemographic characteristics, in a female twin pair cohort. **Methods:** Last known addresses for participants from the Missouri Adolescent Female Twin Study, born 1975-85 and now adults (median age 38), were geocoded and linked to Missouri birth records and American Community Survey data via census tract. Missouri birth records were used to generate five-year aggregate tract-level rates of cigarette smoking during pregnancy and teen pregnancy. We used polychoric correlations to examine monozygotic (MZ) and dizygotic (DZ) correlations between tract level variables, separately for white (W) and Black American (B) female twin pairs. **Results:** Total analysis sample was: W: N=758 (MZ), N=610 (DZ); B: N=110 (MZ), N=150 (DZ). For W twin pairs, census tract smoking during pregnancy rate correlations were MZ $\rho = 0.64$ (SE=0.03) and DZ $\rho = 0.58$ (SE=0.03); for B, correlations were MZ $\rho = 0.47$ (SE=0.09) and DZ $\rho = 0.31$ (SE=0.08). For W, census tract teen pregnancy rate correlations were MZ $\rho = 0.55$ (SE=0.03) and DZ $\rho = 0.54$ (SE=0.04); for B, correlations were MZ $\rho = 0.55$ (SE=0.08) and DZ $\rho = 0.30$ (SE=0.08). For W, census tract percent Black/African American residents correlations were MZ $\rho = 0.46$ (SE=0.03) and DZ $\rho = 0.41$ (SE=0.04); for B, correlations were MZ $\rho = 0.61$ (SE=0.08) and DZ $\rho = 0.46$ (SE=0.09). **Conclusions:** Moderately strong twin pair correlations were observed for all census tract-level outcomes. Correlations were very similar across MZ and DZ W twin pairs for all outcomes, thus there was no evidence that genetic differences between individuals were leading to differences in residential neighborhood characteristics (no gene-environment correlation), but evidence for important family-of-origin environmental influences. In B pairs, while sample sizes were small, we did find stronger correlations for B MZ versus DZ twin pairs, suggesting genetic influences on assignment to environmental context.

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PH-271

INTERSECTIONALITY AND CIGARETTE USE AMONG YOUNG ADULTS

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Introduction: Disparities remain in cigarette use across vulnerable populations. Previous work has examined the independent impacts of identities related to race/ethnicity, sex, and sexual and gender minority identity (SGM) on cigarette use. However, these factors do not exist in isolation but within the context of each other. An approach that takes into account these interconnections is needed. The present study examines how intersectionality may be related to the prevalence of cigarette use among young adults. **Methods:** Participants were 3,575 students aged 18-24 from 24 colleges in Texas who self-reported sex, race/ethnicity, SGM, and past 30-day cigarette use, assessed over seven waves (2014-2018). Examining sex, race/ethnicity, and SGM through an intersectional lens revealed 20 unique social strata that constitute every combination of these 3 sociodemographic identities. Using multilevel methods, we analyzed the fixed effects of sex, race/ethnicity, and SGM; and the random effects of the 20 social strata to determine the impact of intersectionality. We probed higher-level effects by calculating point estimates and 95% CIs of cigarette use prevalence for each social stratum. **Results:** Female ($\beta = -0.07$, $p < 0.01$), Black ($\beta = -0.11$, $p < 0.01$), and Asian ($\beta = -0.07$, $p < 0.01$) individuals had lower prevalence of cigarette use. SGM individuals had higher prevalence of cigarette use ($\beta = 0.11$, $p < 0.01$). Including intersectionality as a higher-level variable revealed that of the total variance in cigarette use prevalence explained by social strata, 10% remained unexplained by the fixed effects, suggesting that intersectionality accounts for variance over and above the isolated sociodemographic identities. Probing the higher-level effects revealed substantial variation across social strata. SGM Other Males (M=0.47, 95% CI=0.35-0.61), SGM Asian Males (M=0.33, 95% CI=0.28-0.39), and SGM Hispanic Males (M=0.32, 95% CI=0.28-0.36) had the highest prevalence of cigarette use across all social strata, significantly greater than nearly all other strata. **Discussion:** Over and above the impact of each individual identity,



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intersectionality further explained differences in the prevalence of cigarette use among young adults. When considering health disparities in cigarette use, an intersectional lens offers a more nuanced examination of the effects of interlocking layers of marginalization.

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PH-272

CIGARETTE SMOKING AND QUIT BEHAVIORS ARE ASSOCIATED WITH SEXUAL ORIENTATION TRANSITION BETWEEN WAVES 1 AND 4 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Introduction: Sexual and gender minority (SGM) populations experience poorer health outcomes compared to their non-SGM counterparts. Studies suggest individuals who change sexual orientation over time report increased substance use. In this study, we examined sexual orientation transition over time and explored the association between sexual orientation transitions and smoking prevalence and quit behaviors. **Methods:** Data from Waves 1 and 4 of the Population Assessment of Tobacco and Health (PATH) Study were used to examine transition of sexual orientation among adults age 18 years and older and the association between sexual orientation transition and cigarette use. We calculated weighted proportions and performed chi-square tests to examine if the transition in sexual orientation was associated with smoking prevalence and quit behaviors from Wave 1 to Wave 4. **Results:** Overall, 21,285 adults participated in both waves. Based on weighted proportions, 5.2% of US adults identified as Lesbian, Gay, Bisexual or something else (LGB) at Wave 1, of whom 34.7% (n=426) transitioned to straight by Wave 4. Among individuals who identified as straight in Wave 1, 1.8% (n=494) transitioned to LGB by Wave 4. Current smoking status remained similar among individuals who were LGB in both waves (30.9% in 1 and 31.4% in 4), straight in both waves (17.6% in 1 and 17.9% in 4), and LGB in Wave 1 and straight in Wave 4 (21.9% in 1 and 22.1% in 4). Current smoking prevalence significantly increased from Wave 1 to Wave 4 for the individuals who identified themselves as straight in Wave 1 and LGB in Wave 4 (18.9% in 1 and 22.9% in 4). Individuals who transitioned from straight to LGB were significantly less likely to quit smoking. Among this group, only 14.8% of Wave 1 current smokers were no longer smoking at Wave 4 compared to 16.7% for those who remained LGB, 17.9% for those who remained straight, and 19.8% for those who were LGB and then straight. **Conclusion:** Although smoking prevalence is highest among LGB individuals, the burden of increasing smoking and unsuccessful quitting is higher among individuals who transition from straight to LGB status. Examining smoking patterns among individuals experiencing transition in SGM identity is essential to address disparities in these unique populations.

FUNDING: Unfunded

PH-273

PUBLIC HOUSING RESIDENTS' CESSATION INTENTIONS, EXPECTANCIES, AND BEHAVIORS ONE YEAR POST-IMPLEMENTATION OF THE FEDERALLY MANDATED SMOKEFREE HOUSING RULE

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Purpose: One goal of the Department of Housing and Urban Development's smokefree public housing rule was to improve the health of residents by incentivizing residents who smoke to quit. Implementing these rules can increase the quit rates of residents, but they have potential to exacerbate problems residents face when trying to quit. This study examines reasons for smoking and cessation behaviors and expectancies of smoking residents affected by the smokefree rule one year after implementation. **Methods:** Data were collected between March and August 2019 at 14 District of Columbia Housing Authority properties from 232 predominantly African-American (89.6%, n=207) residents aged 18-80 who identified as current cigarette smokers. The study measured reasons for smoking, including social, enjoyment, mental health, and weight control, and related differences in cessation expectancies and behaviors 6-12 months post-rule implementation. Descriptive statistics and chi-square analyses were done to examine differences across demographics and resident characteristics. **Results:** Of cigarette smokers, 83.7% (n=185) were thinking about quitting and 48.6% (n=101) considered quitting because of the rule. 57.8% (n=107) were confident they could quit.

Residents who smoke to relax (52.6%, n=71, chi-square=5.64, p>0.05) and relieve stress (53.0%, n=71, chi-square=4.69, p>0.05) were less confident they could quit. Residents reported an average of 4.22 (s.d. 11.20) quit attempts in the last 3 months. The highest number of residents rated quitting on their own useful (33.9%, n=75), followed by nicotine replacement therapy (25.9%, n=57) and medications (20.6%, n=45). Quitlines (19.6%, n=43), e-cigarettes (13.8%, n=30), and apps (16.1%, n=35) were all rated as useful by fewer smokers. **Conclusions:** Results show a gap between expectancies to quit and cessation behavior. Previous findings suggest people of lower SES and African American smokers need more time to quit successfully. One potential avenue for education interventions to support quitting and make quit attempts more successful is to increase awareness of and support for evidence-based quit methods, paired with stress management.

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PH-274

THE FEDERALLY MANDATED SMOKEFREE HOUSING RULE ONE YEAR POST-IMPLEMENTATION SECONDHAND SMOKE EXPOSURE

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Purpose: The Department of Housing and Urban Development required that all public housing in the US become smokefree by August 2018 to improve resident health by eliminating secondhand smoke exposure. This study examines secondhand smoke exposure among public housing residents after the smokefree rule went to effect. **Methods:** Data were collected 8-12 months after rule implementation in the District of Columbia Housing Authority (DCHA). Quantitative survey data were collected from 392 residents (229 smokers, 163 nonsmokers) from 14 properties (11 multiunit housing (MUH) and 3 townhouse communities; 7 family and 7 senior/disabled buildings). Qualitative data were collected from resident focus groups (n=69) and interviews (n=61). Participants indicated how often they smelled smoke in their home from an external source and saliva samples were collected from 94 nonsmokers to assess secondhand smoke exposure via cotinine levels. Descriptive statistics assessed levels of secondhand smoke exposure and chi-square tests were used to examine differences by housing type. **Results:** Forty percent of all respondents reported smelling smoke often or sometimes in their units from an external source (39.7%, n=155). The proportion of respondents reporting smelling smoke were similar across family (39.7%, n=58) and senior/disabled (39.8%, n=97) buildings, and across MUH (41.0%, n=130) and townhomes (34.3%, n=25). Qualitative data from residents indicate smoke incursion in townhomes were the result of neighbors smoking on their decks, patios, or porches. Nearly one-half of nonsmokers (47.9%, n=45) had cotinine levels that suggest moderate to high secondhand smoke exposure. **Conclusions:** Results indicate that a substantial portion of public housing residents are still experiencing secondhand smoke exposure despite the smokefree housing rule. While previous research suggests senior/disabled residents may be less likely to comply with smoke-free rules and townhome residents are less likely to experience smoke incursions, we did not find significant differences across building types. Interventions may be needed to increase compliance with the rule to obtain a smokefree housing environment.

FUNDING: Federal

PH-276

FIRST TOBACCO PRODUCT TRIED PREDICTS CURRENT MULTIPLE PRODUCT USE AND NICOTINE DEPENDENCE AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF ADOLESCENTS

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Objective: Understanding the role of first tobacco product tried in future tobacco use can inform prevention efforts. This study uses a nationally representative sample to examine whether the first tobacco product tried is associated with future multiple product use and nicotine dependence. **Methods:** Participants were 1,999 youth (ages 12-17 years) who had ever tried a tobacco product and completed the Population Assessment of Tobacco Health (PATH) study Wave 1 (2013-2014) and Wave 4 (2016-2018). We conducted multinomial logistic regression to examine associations between Wave 1 reports of first tobacco product tried (i.e., cigarettes, e-cigarettes, cigars, hookah, or smokeless tobacco) and Wave 4 reports of past-30-day tobacco use status (no use,



single product use, and multiple product use). We ran a two-part multivariable model to examine the association between first product tried and nicotine dependence (assessed with the Wisconsin Inventory of Smoking Dependence Motives; WISDM). First trying e-cigarettes was the reference category due to its popularity. All analyses were weighted to account for PATH's complex survey design and controlled for demographics and age of first trying a tobacco product. **Results:** First trying smokeless tobacco (vs. e-cigarettes) was significantly associated with a greater likelihood of multiple product use (both vs. no use and vs. single product use). Among those who endorsed at least 1 symptom of nicotine dependence, first trying smokeless tobacco (vs. e-cigarettes) was associated with higher scores on the WISDM. First trying other products was not significantly associated with our outcomes. **Conclusions:** While rates of tobacco initiation with smokeless tobacco have been relatively low compared to other tobacco products, this study shows that first trying smokeless tobacco places youth at risk for future multiple tobacco product use and nicotine dependence. Tailored interventions should specifically target smokeless tobacco users.

FUNDING: Federal

PH-277

CHANGES IN HARM PERCEPTION OF E-CIGARETTE USE AND THE DETERMINANTS AMONG US ADOLESCENTS AND YOUNG ADULTS: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, 2013-2018

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Significance: This study examined the changes in harm perception of e-cigarettes, as well as the determinants/predictors of the changes over time among young people in the US. **Methods:** Data were used from the Population Assessment of Tobacco and Health Study from 2013-2018 for adolescents (12-17years) and young adults (18-24years). Trend analyses were used to track the changes in harm perception for adolescents and young adults separately. Weighted results were reported for the descriptive statistics for each population. General linear mixed models were conducted to examine the associations between the predictors and the changes in harm perception for each population. **Results:** The proportion of adolescent individuals who perceived e-cigarettes as less harmful than cigarettes significantly decreased from 52.9% (95%CI, 52.0%-53.8%) in Wave 1 to 31.3% (95%CI, 30.5%-32.2%) in Wave 4 ($P=0.042$). Adolescents who were of Hispanic ethnicity and female, ever used cigarettes, with a higher score of susceptibility, with a higher score of sensation-seeking and overall health as poor were less likely to report e-cigarettes as less harmful than cigarettes over time (all $p<0.05$). A similar decline in trend was found among young adults who perceived e-cigarettes as less harmful than cigarettes ($P=0.027$). Females and Hispanic ethnicity were less likely to report e-cigarettes were less harmful than cigarettes over time (all $p<0.05$). **Conclusions:** Females and Hispanic ethnicity were less likely to perceive e-cigarettes as less harmful than cigarettes over time among young people. Appropriate interventions should be implemented regarding the comparative harms of e-cigarettes on these targeted populations.

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PH-278

ASSOCIATION BETWEEN CIGARETTE SMOKING FREQUENCY AND DSM-5 TOBACCO USE DISORDER IN US ADULTS

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Significance Patient's self-reported smoking rate is often used to guide clinical decision-making, but no previous report has described the proportion of cigarette smokers who meet DSM-5 Tobacco Use Disorder (TUD) criteria, nor its severity, across the full range of cigarette use frequency in a representative sample of the US population. **Methods.** We analyzed data from the National Epidemiological Study of Alcohol and Related Conditions - III (NESARC-III), a nationally representative study of the non-institutionalized adult civilian population in the United States. A total of 36,309 individuals (60.1% response rate) participated. The present analysis includes individuals who report past-year cigarette use, no use of other tobacco products and had diagnostic information available ($n=6,793$). In-person interviews were conducted to assess if smokers (a) met DSM-5 criteria for TUD and (b) to identify the number of criteria met (out of 11) as an index of severity. **Results.** There was a clear positive relationship between frequency of cigarette smoking and the proportion of cigarette smokers meeting DSM-5 TUD criteria. Even among those who smoke less than weekly, a substantial minority (26.3%, 95% CI:22.1-30.9) met TUD criteria, as did 47.4% (95% CI: 40.4-54.8) of those who smoked

1-2 days per week. Almost two-thirds of those smoking only 1-4 CPD (cigarettes per day) met TUD criteria (95% CI: 59.4-70.4), rising to 83.2% (95% CI:79.8-86.3) in those smoking 10 CPD. Above 10 CPD, the relationship with TUD became relatively flat, with around 90% meeting TUD criteria up to 91.3% (95% CI: 85.5-95.0) in those smoking 21 or more CPD. DSM-5 states that TUD is considered of "moderate" or greater severity when 4 or more criteria are met, and these data show this is typical at 10 or more CPD. **Conclusion.** The overwhelming majority (85.0%) of daily cigarette smokers and a sizable minority of non-daily smokers (44.0%) meet DSM-5 diagnostic criteria for TUD. Clinicians should ask about all smoking behavior, including non-daily smoking, as such smokers may still require treatment to successfully quit smoking.

FUNDING: Federal

PH-279

BASELINE RESULTS FROM A LONGITUDINAL STUDY OF ADOLESCENT TOBACCO USE IN INDIA

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BACKGROUND: A cohort of early adolescents has been established in India to study tobacco use initiation in the context of family and community environmental factors. **METHODS:** A multi-stage sampling household survey ($n=1982$, 2018-19 baseline) is underway in Kolkata and Mumbai involving young adolescents (12-14 years old) and their main caregivers. Respondents complete four annual questionnaires about tobacco use and individual, family and community risk and protective factors. Sampling weights were used to increase representativeness and control for differential nonresponse. **RESULTS:** The baseline adolescent sample was 50% female, 92% lived with married caregivers, 15% had fathers with post high-school education and 73% lived in households with monthly income of < 15,000 INR (200 USD). Adolescent tobacco use was rare (0.6% ever tried and 0.2% past 30-day use). Risk factors for future use included: intention to use tobacco (8%), peer tobacco use (37%: 33% Mumbai, 45% Kolkata, $p<0.05$), easy tobacco access (18%), and parent tobacco use (9% mothers and 34% fathers). Adolescents reported talking to parents about harms of tobacco use (30%: 34% Mumbai, 21% Kolkata, $p<0.05$). Weekly secondhand smoke exposure was low in homes (16%: 7% Mumbai, 34% Kolkata, $p<0.001$) but higher outside homes (52%: 32% Mumbai, 91% Kolkata, $p<0.001$). As to community factors, adolescents reported seeing tobacco ads near home (26%: 17% Mumbai, 45% Kolkata, $p<0.001$) and school (22%: 13% Mumbai, 40% Kolkata, $p<0.001$) and reported 'a lot' of tobacco retailers near home and school (17% and 14%, respectively). **CONCLUSIONS:** Because the adolescent respondents were young, tobacco use rates were vanishingly low. Kolkata adolescents reported more peer use, secondhand smoke exposure and presence of tobacco ads, putting them at higher risk of future use compared to Mumbai adolescents. Longitudinal associations between multilevel factors (individual-level, family-level, community-level) and adolescent tobacco use initiation will be examined using the follow-up data.

FUNDING: Federal

PH-280

CO-USE OF CANNABIS AND TOBACCO IN ADOLESCENT AND YOUNG ADULT (AYA) FEMALES IN NEW YORK CITY (NYC)

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Background: Over the past decade, the United States (U.S.) has experienced increasing divergence in trends for cannabis and tobacco use among AYA populations. Little is known about concurrent use (co-use) of cannabis and tobacco, particularly among youth of color. **Methods:** We assessed the prevalence and changes in co-use of cannabis and tobacco in a cohort of AYA females attending the largest AYA-specific health center in the U.S., located in New York City between 2013 and 2019. Past 30-day use and frequency, and age at start of cannabis, tobacco, and alcohol use were assessed by self-report questionnaire. Co-use of cannabis and tobacco included concurrent cannabis and tobacco smoking in the form of cigarettes, cigars or cigarillos, and adding tobacco to marijuana blunts. We also asked about correlates of use, including ethnic and racial background, use of social services, drug use, and sexual activity. Risk of substance use problems was assessed using the CRAFFT scale, a clinical tool developed to screen adolescents for alcohol and other drug use disorders. **Results:** The



study cohort included 1549 AYA females aged 13-21 at baseline, 95% of whom were youth of color. Recent (past 30 day) cannabis and tobacco smoking was reported by 38.6% and 16.1%, respectively. Among recent users of either cannabis or tobacco, the prevalence of dual use of cannabis and tobacco, increased over the last 6 years from 26.1% (95%CI:23.3-29.1) in 2013 to 38.4% (CI:34.5-42.5) in 2019. The likelihood of dual use increased for frequent cannabis users (≥ 20 vs < 20 times in the past 30 days; odds ratio [OR]=2.80, CI:1.93-4.06), and among those who first used cannabis before age 16 (OR=1.48, CI:1.18-1.86). Co-use of cannabis and tobacco was associated with increased risk of substance abuse (CRAFT < 2 vs ≥ 2 ; OR=1.55, CI:1.36-1.76), and was more likely among those who had ever used hard drugs or prescription drugs to get high (OR=2.36, CI:2.01-2.78). **Conclusions and Relevance:** Whereas rates of tobacco smoking have declined nationally, co-use of cannabis and tobacco may be rising among inner-city minority AYA females, with potential ramifications on future addictive and substance use behaviors.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PH-281

SMOKING AND VAPING AMONG NEW YORK CITY (NYC) ADOLESCENTS AND YOUNG ADULTS (AYA) DURING THE COVID-19 PANDEMIC

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Background: NYC was the global epicenter of the COVID-19 pandemic in spring 2020. The NY shelter-in-place mandate issued in March 2020 disproportionately impacted communities of color. The effect of the pandemic on substance use behaviors, including tobacco and cannabis smoking and vaping, has not been well documented in youth of color. **Methods:** The survey sample included 401 inner-city females aged 15-28 from Mount Sinai Adolescent Health Center, 94% of whom were Latino or non-Hispanic Black. To assess the impact of the pandemic and mitigation efforts on this population, we administered an online survey via REDCap between May and July, 2020. Questions asked about changes in tobacco, cannabis, alcohol and drug use, and vaping. In addition, we asked about financial impacts, as well as stress indicators, such as depression and anxiety. **Results:** Compared to patterns observed before the pandemic, significant increases in use of tobacco (+52%) and cannabis (+40%) occurred during the pandemic. Recent (past 30-day) cannabis use during the pandemic was reported by 41% of AYA women, with 22% reporting almost daily use (≥ 20 times in last 30 days). Past 30-day and almost daily tobacco smoking were reported by 6% and 3%, respectively. Two thirds experienced financial losses (68%) and increased anxiety (64%) during the first months of the shelter-in-place period, and 37% were found to be clinically depressed (CES-D score > 10). The increase in anxiety was accompanied by an increase in alcohol use (age and race adjusted odds ratio[OR]=1.28, 95%CI:1.18-3.08), cannabis use (OR=1.72, CI:1.06-2.79) and to a lesser extent, tobacco smoking (OR=1.42, CI:0.90-2.94, p=0.069), although it was associated with almost daily tobacco smoking (OR=2.37, CI:1.05-5.35). In contrast, 8% reported vaping e-cigs, pens, mods, etc. with 45% of those reporting a decrease in use compared to before the pandemic; no significant associations were observed with frequency or change in vaping and anxiety. **Conclusion:** The COVID-19 pandemic had unprecedented physical and mental health impacts on NYC AYA women. These were accompanied by increases in tobacco smoking and cannabis use, but not vaping.

FUNDING: Federal; Academic Institution

PH-282

SMOKING STATUS AND RISK OF CORONAVIRUS INFECTION AND ILLNESS IN A HIGHLY CONTROLLED CHALLENGE STUDY FROM THE UNITED KINGDOM

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Significance- The association between smoking and risk of COVID-19 progression and severity are well described, but fewer studies have described risks of COVID-19 infection. We re-analyzed data from the British Cold Study to calculate the risk between smoking and infection (instead of only illness as originally reported) and whether the association differed for a coronavirus to other virus types. **Methods-** The British Cold Study was a 1986-89 challenge study that intentionally exposed 391 adults ages 18-54 to 1 of 5 respiratory viruses (including 14% coronavirus 229E) and monitored their progression to a clinical cold. Adults were considered smokers if they had cotinine levels above 15

ng/mL. Outcomes included 1) infection, as measured by viral shedding and/or 4 times the increase in antibody titers to the challenge virus, and 2) illness, based on presence of infection and physician diagnosis of a cold. We calculated the relative risk for smoking and each outcome using SAS PROC GENMOD's log-binomial regression and adjusted for seropositivity for the viruses before the challenge, age, sex, education, allergy to food or drug, BMI, season, number of roommates, virus type, alcohol consumption, and stress. We examined if each association was modified by type of respiratory virus by including an interaction term (smoking*type of virus). **Results -** A total of 88.4% of smokers developed infection, compared with 79.9% of non-smokers. The adjusted risk ratio for infection in smokers compared with non-smokers was 1.11 (95% CI: 1.01, 1.24). A total of 42.0% of smokers were diagnosed with illness, compared with 36.6% of non-smokers. The adjusted risk ratio for illness in smokers compared with non-smokers was 1.43 (95% CI: 1.08, 1.91). Neither association was modified by type of virus (p value for interaction term: infection=0.44 and illness=0.76). **Conclusion -** Among adults exposed to a coronavirus or other respiratory viruses, smokers had an 11% increased risk of becoming infected and a 43% increased risk of being diagnosed with a cold compared with non-smokers. Future research is needed to examine this association for COVID-19 which has a different type of coronavirus.

FUNDING: Unfunded

PH-283

SOCIO-DEMOGRAPHIC CORRELATES OF E-CIGARETTE USE IN SOUTH AFRICA DURING 2017-2018: FINDINGS FROM A NATIONAL HOUSEHOLD SURVEY

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Significance: Despite the introduction of electronic cigarettes (e-cigarettes) into the South African market about ten years ago, there remains no effective regulation and only limited information is available on current e-cigarette use. Hence, this study sought to determine the prevalence and the socio-demographic correlates of e-cigarette use among South African adults. **Methods:** This study involved the analysis of the pooled data from the 2017 and 2018 South African Social Attitude Survey (SASAS)(n=5700). The SASAS is a nationally representative sample of South African adults ≥ 16 -years old. Data obtained among others, included participants' sociodemographic profile, e-cigarettes use, smoking status and intention to quit smoking. Current e-cigarette users are those who currently use e-cigarettes every day or some days. Analysis included chi-square and multi-variable adjusted logistic regression. **Results:** The prevalence of current e-cigarette use was 2.2% (95% CI: 1.5-3.1) and there was no significant difference between 2017 and 2018 (1.6% vs. 2.7%; p=0.129). Of the e-cigarette users, 85.2% (n=87) also currently smoke. E-cigarette use was more common among those younger than 35 years than those older (3.5% vs. 1.1%; p<0.001) and more common among males than females (3.6% vs. 0.8%; p<0.001). Similarly, current smoking was more common among males than females (33.8% vs. 10.8%; p<0.001). Intentions to quit smoking was not different among current e-cigarette users when compared to non-users (33.4% vs. 38.3%; p=0.649). After controlling for current smoking, being female remained associated with significantly lower odds of e-cigarette use (OR= 0.458; 95%CI: 0.214-0.980), but being younger than 35 years (OR=3.844; 1.684-8.772) and self-identifying as White as compared to African black (OR=4.852; 1.853-12.704) remained associated with significantly higher odds of e-cigarette use. **Conclusion:** E-cigarette use is not associated with intention to quit smoking and seems to be predominantly among whites and younger South African adults. The study findings highlight the need for regulation of e-cigarettes and targeted cessation support for younger adults in South Africa.

PH-284

PATTERNS OF POLYDEVICE USE AMONG ADOLESCENTS WHO USE ELECTRONIC CIGARETTES: A CLUSTER ANALYSIS

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Significance: Recent federal surveillance research indicates that the prevalence of current e-cigarette use more than doubled for adolescents from 2017 to 2019. While much of this increase has overlapped with the rapid uptake of JUUL, a more complete characterization of product characteristics and usage patterns among adolescents is needed to inform regulatory science and intervention design. **Methods:** This study investigated polydevice use among adolescents (grades 6, 8, 10, and 12) who completed a behavioral health surveillance survey in the fall of 2018 (N=2,086). Agglomerative hierarchical cluster analysis was used to classify 576 past-month e-cigarette users based upon their reported use of 10 devices: JUUL, Suorin Drop, Aspire, Halo, V2, Drag,



Alien, Smok, other brands, and unknown brands. **Results:** Overall, current e-cigarette users reported using an average of three devices in the past month. Five discernible polydevice patterns were identified in the cluster analysis. Cluster 1 (16% of the sample) was characterized by predominant use of JUUL. The most common devices for cluster 2 (20.5% of the sample) were Smok (55.9%), other brands (54.2%), and JUUL (32.2%). Virtually all of cluster 3 (16.5% of the sample) reported use of unknown devices (98.0%) as well as JUUL (37.9%) and Smok (14.7%). Cluster 4 (41.7% of the sample) reported high use of JUUL (92.9%), Smok (87.5%), and Alien (34.6%) in combination with V2 (20.8%), Suorin Drop (20.0%), and Drag (18.3%). Cluster 5 (5.4% of the sample) had the highest device usage (mean=8 devices), with widespread endorsement across the device brands (range 64.5-100%). The prevalence of cigarette smoking was highest among cluster 4 (33.6%) and cluster 5 (54.8%). Similarly, clusters 4 and 5 had the highest prevalence of lifetime cannabis vaping (48.8% and 77.4%, respectively). Clusters 1 (60.9%) and 3 (65.3%) were predominantly female, while cluster 5 was predominantly male (64.5%). **Conclusions:** The results from this study indicate that polydevice use is ubiquitous among adolescent e-cigarette users and that many adolescents are unaware of the types of products they use. Polydevice use is also strongly associated with use of cigarettes and high-potency cannabis. Future research should examine how device use may be associated with other substances as well as evaluate the effects of tobacco prevention strategies on polydevice use among youth. Results of our study can help inform regulatory efforts related to device brands and product characteristics that are gaining popularity with adolescents.

FUNDING: Federal

PH-285

CIGAR USE TRAJECTORIES AMONG NEW CIGAR INITIATORS: A TWO-PART LATENT GROWTH CURVE MODEL AMONG YOUTH AND YOUNG ADULTS

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Youth and young adults (YYA) are at high risk for cigar use, which is associated with increased mortality and morbidity. This study examined growth trajectories of current use and frequency among new YYA cigar, little cigar and cigarillo (CLCC) initiators, and differences by race/ethnicity and other sociodemographics. Using the nationally representative Truth Longitudinal Cohort (TLC) of YYAs, we conducted a two-part latent growth curve model to examine the trajectories of (1) the likelihood of past 30 day CLCC use and (2) number of days/mo. of CLCC use over 2 years among those who initiated CLCC use within the study period (n=1,483). Initiation was defined as transitioning from never to ever CLCC use within a 6-month period. CLCC initiators had a 42% probability of becoming a past 30-day user within six months of initiation ($p < .001$), and the probability of past 30-day use decreased over time. Past 30-day users had an average of 1.95 days of use/mo. within 6 months of initiation ($p < .001$) and a linear increase of .38 days/mo. per 6-month interval ($p < .01$). Within 6 months of initiation, participants who were younger, non-Hispanic Black and ever-marijuana users were more likely to be past 30 day users. Findings also showed higher frequency of use within 6 months of initiation among past 30-day users who were non-Hispanic Black, ever used marijuana or were unable to meet basic expenses. Frequency of CLCC use over time increased at a faster rate among younger initiators compared with older initiators. This is the first study among YYA to examine CLCC use trajectories among recent initiators. We found a high probability of past 30-day CLCC use shortly after initiation, declining use over time, increasing frequency among continuing users, and subgroups with a higher risk of use and greater frequency of use. CLCC-specific interventions and examination of relevant social factors that put certain groups at higher risk are needed to prevent progression of use.

FUNDING: Nonprofit grant funding entity

PH-286

PREVALENCE AND CORRELATES OF AWARENESS AND EVER USE OF HEATED TOBACCO PRODUCTS AMONG US ADULTS: FINDINGS FROM THE 2019 TUS-CPS

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Significance: IQOS, a leading brand of contemporary heated tobacco products (HTPs), recently received authorization from the United States (US) Food and Drug Administration to market their products using reduced exposure claims. While there is rising popularity of contemporary HTPs globally, there are limited studies examining awareness

and ever use of HTPs among adults in the US, along with sociodemographic and nicotine use status correlates of HTP awareness and ever use. Methods: Data were analyzed from the Tobacco Use Supplement of the Current Population Survey from May 2019 (n=43,665). Weighted descriptive statistics were computed overall and by sociodemographics (sex, age, annual household income, highest educational level attained, race, US geographic region) and current (past 30-days) non-therapeutic nicotine use (smoking and vaping status). Multivariable logistic regression was used to examine correlates of HTPs awareness and ever use. Results: Overall, awareness of HTP was 8.99% (95%CI: 8.63%-9.35%), while ever use was 1.02% (95%CI: 0.88%-1.15%). Prevalence of HTP ever use among current smokers was 2.35% (95%CI: 1.75%-2.96%), more than double that of the general adult population, while among current vapers was 4.21% (95%CI: 2.62%-5.80%), more than four times that of general adult population. HTP awareness was associated with being males, younger adults, having annual household income < \$20,000 (vs \$20,000 to \$39,999), residing in the Western US (vs. Northeastern), current smokers (vs. never smokers), and current vapers (vs. non-vapers). Odds of ever use of HTPs were higher among males, younger adults, current and former smokers (vs. never smokers), and current vapers (vs. non-vapers). Conclusion: As of May 2019, nearly one in ten US adults were aware of HTPs and approximately one in one hundred had ever used HTPs, including one in forty current smokers and one in twenty-five current vapers. Sex, age, and nicotine use status were correlates of both awareness and ever use of HTPs. Future work is necessary to monitor the uptake of HTPs in the US, especially among youth and tobacco-naïve individuals.

FUNDING: Federal

PH-287

VARIATIONS IN SUSCEPTIBILITY TO DIFFERENT TOBACCO TYPES IN COLORADO YOUTH, 2019

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Significance: The use of electronic nicotine delivery devices (ENDS) has been on the rise in recent years, especially among adolescents and youth adults. There is growing concern that ENDS use eventually leads to the initiation of smoking. Understanding what factors make high school students more susceptible to try ENDS, and how those susceptibility factors are similar to or different from cigarette susceptibility factors, is essential to prevent future smoking. **Methods:** The Healthy Kids Colorado Survey (HKCS) was administered statewide to a large random sample of Colorado public school students in grades 9-12 in 2019. Responses from selected questions were analyzed to identify predictors of tobacco-use susceptibility and to compare susceptibility to cigarette smoking vs. ENDS use. **Results:** Cigarette and ENDS susceptibility were both higher among 9th graders; gay, lesbian, and bisexual youth; students in households whose members frequently used tobacco products; frequent users of social media; students with lower GPAs; students who reported symptoms of depression; and students who had seen an ENDS ad/promotion in the last 30 days. ENDS susceptibility was higher in females, while no gender difference existed for cigarette susceptibility. Susceptibility to both ENDS and cigarettes was significantly lower among Black students than among Hispanic and white students. ENDS susceptibility was significantly higher than cigarette susceptibility among Hispanic students, while ENDS and cigarette susceptibility did not differ among Black or white students. Cigarette susceptibility was significantly higher among students who reported having ever used an ENDS product and students who used an ENDS product at least 1 day in the last 30 days. **Conclusion:** These findings suggest that when designing or revising educational campaigns around ENDS in Colorado, messaging may be more effective if it targets certain groups, such as females and Hispanic students. Additionally, these findings provide further evidence that while susceptibility to ENDS use may differ from susceptibility to cigarettes initially, ENDS use may ultimately contribute to future cigarette use, and poses a significant public health threat to young people.

FUNDING: State; Academic Institution



PH-288

USUAL AND PAST 30-DAY TOBACCO, POLY-TOBACCO, AND CO-OCCURRENT TOBACCO AND MARIJUANA USE AMONG COMBUSTIBLE TOBACCO USERS AT A HOMELESS YOUTH DROP-IN CENTER

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Significance: Upwards of 70% of homeless youth in the US smoke combustible tobacco. The purpose of this study was to describe current tobacco and marijuana product use among combustible-tobacco smokers utilizing a homeless youth drop-in center. **Methods:** Youth who currently smoked combustible tobacco products were recruited on 30-day quit intension from a drop-in center serving homeless adolescents (aged 14-24) to complete an interview-administered quantitative surveys (n=96) in early 2020. Sample characteristics included 56% male, 74% heterosexual, and 81% black or multi-racial. 55.2% expressed interest in quitting smoking in the next 30 days. **Results:** In the past 30 days, the usual tobacco product adolescents smoked included cigarettes (70.8%), cigarillos, little cigars, or flavored cigars (17.7%), cigars (6.3%), marijuana mixed with tobacco (2.1%), electronic vapor products (1.0%), and multiple products (2.1%). A usual brand was reported by 88.5% of combustible tobacco smokers. Past 30-day poly-tobacco use and co-occurrent tobacco and marijuana use were common. In the past 30 days, 94.5% of youth reported smoking cigarettes, with Newport (81.5%) named most frequently as a usual brand. Of cigarette smokers, 75.3% stated their usual brand was flavored, almost exclusively with menthol or mint (96.7%). In the past 30 days, 94.7% of youth reported smoking cigars, cigarillos, little cigars, or flavored cigars. 80.9% of youth reported using a usual brand, with Black & Mild and Swisher Sweet named most frequently. Of cigar and little cigar users, 48.7% stated their usual brand was flavored, with a fruit (32.4%), alcohol (27.0%), and candy or other sweet (21.6%) being the most common named flavors. Past 30-day use of hookah (34.6%), electronic vapor product (49.3%), and smokeless tobacco (39.3%) was also common. Most (88.2%) youth also reported past 30-day marijuana use, including blunt (85.4%) and spliff (34.4%) use. **Conclusion:** Poly-tobacco use, and co-occurrent tobacco and marijuana use, are common among homeless adolescents. Interventions to support cessation in the population must address poly-use.

FUNDING: Federal

PH-289

A META-ANALYSIS OF INCIDENT HUMAN BETA-CORONAVIRUS (SARS-COV-2 (COVID-19), SARS, MERS, OC43, AND HKU1) INFECTION ODDS RATIOS IN CURRENT SMOKERS VERSUS ALL OTHERS

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Significance: Current tobacco smoke exposure (smoking) impairs respiratory and immune defenses. Smokers have excesses of incident respiratory, influenza, coronavirus 229E, and maybe beta-coronavirus (beta-CoV) infections (SARS-CoV-2 and its closest human coronavirus relatives, SARS, MERS, OC43, and HKU1). There is currently limited and biased information on smoker odds ratios (OR) of incident SARS-CoV-2 infection. Quantifying smoker ORs of incident beta-CoV infections with near concurrent (so less biased) smoking and infection assessment may help clarify likely impacts of smoking and tobacco control on COVID-19 incidence. **Methods:** We used standard PRISMA methods and smoking, coronavirus, and study type keywords to locate studies with near concurrent current smoking status for incident beta-CoV cases and controls. They had current (versus all other) smoking status for beta-CoV (MERS, OC43, HKU1) cases and alpha-CoV (229E) or other controls. 229E cases were used as a control when community controls were unavailable since the smoker OR of 229E incidence is available from a high-quality challenge study. We calculated smoker OR for incident beta-CoV cases versus incident 229E cases or community controls from these studies and created a forest plot in RevMan of the ORs. The studies were weighted and analyzed via the Mantel-Haenszel method with fixed effects. **Results:** 4 out of 578 studies were selected. The smoker OR for community MERS cases in Saudi Arabia was 2.47 (95% CI 1.03, 5.94) versus controls. Smoker ORs for OC43 and HKU1 were 2.41 (95% CI 1.35, 4.30) and 3.57 (95% CI 1.26, 10.10) respectively versus incident 229E controls. The weighted OR for beta-CoV smokers compared to control/229E smokers was 2.59 (95% CI 1.67, 4.02). **Conclusion:** Smokers had strong, consistent beta-CoV excesses across 3 countries and 4 studies, even without including adjustments which raised the smoker MERS OR to 6.84 (95% CI 1.68, 27.94). The observed ORs are generally consistent with related studies that have been conducted in the UK and Saudi Arabia. Strengthening comprehensive tobacco control may greatly reduce incident COVID-19 and other beta-CoV infections.

PH-290

THE ASSOCIATION BETWEEN PART-TIME JOB EXPERIENCE AND TOBACCO SMOKING IN ADOLESCENTS - ANALYSIS ON KOREA YOUTH RISK BEHAVIOR WEB-BASED SURVEY DATA 2017

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Significance: Previous studies reported the association between allowance and smoking rate in adolescents and the possibility for adolescents to do part-time jobs to purchase tobacco. Youth part-time jobs are becoming more common, of which the types and purposes have recently changed. We tried to assess the association between part-time job experience and smoking in adolescents. **Methods:** We analyzed 62,276 (31,624 boys and 30,652 girls) who participated in the 2017 Korea Youth Risk Behavior Web-based Survey. Frequency analysis, chi-square test, and logistic regression analysis were performed to understand the characteristics of variables such as demographic and socioeconomic factors and to analyze the association between lifetime experiences of part-time jobs and tobacco use (ever smoking). **Results:** Among the participants, 13.1% (n=8,150) of adolescents had a lifetime smoking experience, of which students with part-time job experiences were higher. In logistic regression analysis, the risk for persons with part-time job experience to have lifetime smoking experience was significantly higher (odds ratio 1.87, 95% confidence interval: 1.75-2.00) after adjusting demographic, socioeconomic, and smoking-related factors. **Conclusions:** Part-time job experiences have a significant association with ever smoking in Korean adolescents. The mechanism of attempts to smoke and purchasing cigarettes should be found out and provided to develop policies to prevent smoking among adolescents.

FUNDING: Unfunded

PH-291

THE ROLE OF E-CIGARETTES AND HEATED TOBACCO PRODUCTS IN ADOLESCENT CIGARETTE SMOKING CESSATION

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Significance E-cigarettes and heated tobacco products (HTPs) are claimed to aid cigarette smoking cessation but evidence is scarce, particularly in adolescents. We investigated the associations of e-cigarette and HTP use with quitting in ever smokers and intention to quit in current smokers in adolescents. **Methods** In a territory-wide school-based smoking survey in 2018-19 in Hong Kong, 33 991 secondary school students (US grade 7-12) reported their status (never, former, current) of cigarette, e-cigarette and HTP use, intention to quit cigarette smoking (yes/no), and other co-variables. Logistic regression models were used to assess the associations adjusting for sex, age, perceived family affluence, alcohol drinking, lifetime cigarette smoking heaviness (daily smoking, non-daily smoking and only a few puffs), and family tobacco use. **Results** The mean age (standard deviation) was 14.8 (1.9) years and 54.2% were boys. Among 3148 (9.3%) students who had ever smoked cigarettes, 50.6% and 23.2% had also ever used e-cigarettes and HTPs, respectively. Smoking cessation (former vs current smoking) was inversely associated with ever use of e-cigarettes (adjusted odds ratio 0.46, 95% CI 0.35-0.60) and HTPs (0.48, 0.38-0.62) in ever smokers (excluding those who had only smoked a few puffs). Intention to quit cigarette smoking was not associated with concurrent use of e-cigarettes (0.82, 0.49-1.36) or HTPs (0.88, 0.59-1.31) in current smokers. **Conclusion** In Hong Kong adolescents, e-cigarette and HTP use were inversely associated with quitting in ever cigarette smokers. These results support the proposed total ban of new tobacco products in Hong Kong.

FUNDING: Nonprofit grant funding entity; Other

PH-292

CHANGES IN SMOKING BEHAVIORS IN ISRAEL DURING THE FIRST WAVE OF THE NOVEL CORONAVIRUS

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SIGNIFICANCE: The first case of coronavirus in Israel was diagnosed in February 2020. This quickly led to a national lockdown, which included severe restrictions on travel, school and business closures, stay-at-home directives, and prohibitions on moving more than 100 meters from the home. Following control of the spread of coronavirus,



most restrictions were lifted by early April 2020. This study aimed to determine the impact of the first wave of coronavirus on tobacco and nicotine use among Israeli adults. **METHODS:** A consumer panel survey with 800 respondents was conducted. We analyzed use and changes in use of combustible cigarettes, nargilla (hookah), electronic cigarettes, and IQOS. **RESULTS:** Distributions of population subgroups (Jews, Arabs), gender, age distribution, and geographic area were similar to population distributions. Among participants in the survey, about half had ever used or tried a least one type of inhalable tobacco or nicotine product. Some users reporting quitting their habit because of corona (cigarettes: 4.0%, nargilla: 6.1%, vaping: 3%, IQOS: 0.3%). Few former users returned to use because of corona (cigarettes: 1.6%, nargilla: 0.6%, vaping: 3%, IQOS: 0.5%). Some users increased their consumption (cigarettes: 8.5%, nargilla: 1.7%, vaping: 0.6%), while others reduced their consumption (cigarettes: 9.3%, nargilla: 4.7%, vaping: 1.2%). The majority of users of each product (70%-90%) did not change their habits. **CONCLUSIONS:** Rapid changes in consumption of tobacco and nicotine products occurred during the first wave of the coronavirus in Israel. Patterns of consumption may change rapidly with changes in restrictions on movement of individuals and marketplace changes. It is crucial to monitor population level changes in order to promote smoke-free societies.

FUNDING: Academic Institution

PH-293

A SURVEY IN THE UNITED STATES OF ATTITUDES TO NICOTINE CESSATION IN SMOKERS - SMOKERS' SATISFACTION WITH AVAILABLE TREATMENTS

Anthony Clarke, Jaime Xinos, Richard Stewart. Achieve Life Sciences, Seattle, WA, USA.

Background: Despite the availability of over-the-counter (OTC) and prescription medications, their success in helping smokers to quit leaves room for improvement. We conducted a survey in a population of smokers to determine their journey in trying to quit. **Methods:** We conducted a 15-minute online survey between 27 August and 2 September 2019 to determine smokers' opinions on cessation medications. Adult participants (19-64y) were current smokers or smokers who quit within the past year (but not in the past month) who smoked daily. All must have used a prescription pill (varenicline or bupropion) and/or NRT to help them quit. An honorarium of \$3.50 was paid. **Results:** 1,122 respondents (986 smokers and 136 recent quitters) took part. Overall, medication use was a prescription pill (531; 47.3%), prescription NRT (318; 28.3%) or OTC NRT (273; 24.3%). Satisfaction with treatment with varenicline 30%, bupropion 24%, e-cigarettes 33%, prescription NRT 23% and OTC NRT 18%. Only 255 (48%) of pill users completed the course of treatment with the most common reasons reported as side effects (156, 61%) and lack of efficacy (42, 27%). In the 591 respondents who did not use a prescription pill, reasons were concerns about side-effects (49%), cost (46%), risk of suicidal thoughts (44%) and lack of efficacy (42%). **Conclusions:** Overall satisfaction with available treatments was low with NRT being the least effective. Concerns about side-effects was the most common reason for discontinuation of varenicline and bupropion and for not using a prescription medication. There remains a need for an effective, better tolerated treatment to help smokers to complete succeed in their quitting journey.

FUNDING: Pharmaceutical Industry

PH-294

A SURVEY IN THE UNITED STATES OF ATTITUDES TO NICOTINE CESSATION IN VAPERS - REASONS FOR CHOOSING TO VAPE

Anthony Clarke, Jaime Xinos, Richard Stewart. Achieve Life Sciences, Seattle, WA, USA.

Background: The popularity of vaping has risen dramatically in recent years. We conducted a survey in a population of vapers to determine their reasons for vaping and reasons for wishing to quit. **Methods:** We conducted a 15-minute online survey between 29 February and 12 March 2020. Adult participants (19-64y) were current daily nicotine vapers and expressed an interest to quit vaping within the next year. An honorarium of \$9.00 was paid. **Results:** 508 respondents took part comprising 249 (49%) "past smokers" who previously smoked cigarettes but had quit, 247 (49%) "dual users" who currently both vaped and smoked and 12 (2%) "never smokers". "To help quit smoking" was the primary reason for starting to vape in 202 (81%) and 153 (62%) of past smokers and dual users respectively, but 209 (84%) and 178 (72%) and respectively felt they were "addicted to vaping". **Conclusions:** Almost all of the respondents

were previous smokers or current dual users. A significant proportion reported feeling addicted to vaping, even though the principal reason for starting to vape was a desire to quit. Vapers, like smokers, need help to quit.

FUNDING: Pharmaceutical Industry

PH-295

A SURVEY IN THE UNITED STATES OF ATTITUDES TO NICOTINE CESSATION IN VAPERS - THEIR PLANS TO QUIT VAPING

Anthony Clarke, Jaime Xinos, Richard Stewart. Achieve Life Sciences, Seattle, WA, USA.

Background: The popularity of vaping has risen dramatically in recent years. We conducted a survey in a population of vapers to determine their reasons for vaping and reasons for wishing to quit. **Methods:** We conducted a 15-minute online survey between 29 February and 12 March 2020. Adult participants (19-64y) were current daily vapers. An honorarium of \$9.00 was paid. **Results:** 508 respondents took part comprising 249 (49%) "past smokers" who previously smoked cigarettes but had quit, 247 (49%) "dual users" who currently both vaped and smoked and 12 (2%) "never smokers". The proportions that "plan to quit vaping someday" was similar in past smokers and dual users: 92% and 88% respectively. Advice from a healthcare professional about quitting was sought by 124 (50%) and 207 (84%) of past smokers and dual users respectively. **Conclusions:** The proportion of vapers expressing a desire to quit was high. Dual users were more likely to seek professional advice than past smokers but plans to quit were similar in both groups. The number of vapers wishing to quit and seeking professional advice is likely to increase over time as the absolute number of vapers increases.

FUNDING: Pharmaceutical Industry

PH-296

INTERNALIZING AND EXTERNALIZING SYMPTOMS ON CURRENT, FORMER, AND NEVER SMOKERS ON REPORTED LEVELS OF PAIN - FINDINGS FROM WAVE 4 OF THE PATH STUDY

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Objective: The use of marijuana, tobacco, and oral opioid analgesics have long been associated with psychological distress and chronic pain. The aim of the study was to identify the effects of internalizing and externalizing symptoms through psychometric analysis of the GAIN-SS scale on current, former, and never smokers on reported levels of pain. **Methods:** Participants with complete data on variables for the relationship between cigarette smoking, psychological distress, and pain levels (n=32,551) from Wave 4 (2016-2018) of the Population Assessment of Tobacco and Health (PATH) Study were included in this study. Psychometric analyses were conducted to assess reliability through Cronbach's alpha, and content, construct and criterion validity. A multinomial logistic regression model examined use of painkillers as a function of smoking status, pain intensity, alcohol and marijuana use, GAIN-SS factors and select sociodemographic characteristics. Wave 4 specific weights were used to account for non-response and missing factors while adjusting for demographics and substance use. **Results:** The Exploratory Factor Analysis resulted in a three factor model that best fit the data. Correlations between factors indicated a strong model fit (RMSEA (0.058) TLI (0.976), CFI (0.979) and SRMR (0.052)). The expected risk of having moderate and high pain was higher for established smokers (>100 lifetime cigarettes smoked) compared to non-established, as age increased, and as education and household income decreased. Risk of having moderate and severe pain is 6 times among those who used analgesics not prescribed to them in the last 30 days compared to those who did not use painkillers. Expected risk of having moderate and severe pain was higher among those who used marijuana and anti-inflammatory medications for pain management and lower among those who used alcohol in the past 30 days compared to those who did not. **Conclusion:** Current and former established cigarette smoking, marijuana use, and oral analgesic use were associated with high levels of pain intensity suggesting that reported pain is an important factor to consider in smoking cessation counseling programs.

FUNDING: Unfunded; Academic Institution



PH-297

SALES OF "TOBACCO-FREE" NICOTINE POUCHES IN 30 MAJOR US CITIES

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Significance: "Tobacco-free" nicotine pouches are one of the industry's newest products on the US market, with some online ads asking smokers if they are ready to quit. The products are available in more than a dozen flavors and are used discreetly, features that appeal to youth. Little is known about sales in diverse US cities. **Methods:** For 30 major US cities, we analyzed custom Nielsen sales data from 7 retail channels combined for Sept. 2015-Sept. 2019. City- and brand-specific average monthly dollar sales per 100,000 adults were computed for the most recent year. T-tests and Tukey's multiple comparison test compared average monthly sales by early (2016) vs. later (2017-2019) product entry and by quartiles of adult smoking prevalence (measured in 2017). T-tests also compared early vs. later product entry by adult smoking prevalence (continuous). Analyses exclude Denver, where sales were nearly 5 SD above the mean, unduly influencing tests of association. **Results:** "Tobacco-free" nicotine pouches were sold in 9 of 10 cities in the western census region by Dec. 2016, but did not appear in 3 of 5 midwestern cities, 3 of 4 northeastern cities, and 10 of 11 southern cities until April 2019. By Sept. 2019, ZYN (Swedish Match) was sold in all 30 cities; Velo (RJ Reynolds) in 24, ON! (Altria) in 17, and Dryft (Kretek Intl) in 9 cities. The mean value for average monthly sales per 100,000 adults was \$1,530 (SD=\$2,120). Average monthly sales were higher for ZYN (M=\$1,384) than ON! (M=\$257), Velo (M=\$59), and Dryft (M=\$55). Sales were greater in cities where products entered the marketplace earlier (M=\$3,258 vs. M=\$752, $p=.02$) and cities in the lowest vs. highest quartile of adult smoking prevalence (\$2,835 vs. \$261, $p=.09$). Products were sold earlier in cities with lower adult smoking prevalence (M=15.3% vs. M=19.4%, $p=.01$). **Conclusion:** New nicotine pouches are gaining a foothold in US markets. A higher sales volume and earlier product introduction in cities with lower smoking prevalence is inconsistent with industry claims that products are intended for and marketed to adult smokers. Monitoring use and educating youth about the harms of these new products is critical.

FUNDING: Federal

PH-298

ASSOCIATION BETWEEN ASTHMA-RELATED PRODUCTIVITY LOSS AND CIGARETTE SMOKING AND E-CIGARETTE 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 that tobacco use plays in causing or exacerbating asthma's negative effects on youth. This study examined the association of cigarette and e-cigarette use with asthma-related productivity loss among U.S. youth (aged 12-17). **Methods:** We used the Population Assessment of Tobacco and Health Youth wave 4 data (2016-2018; N=13,903) to estimate a two-part econometric model. In the first part, we used logistic regression to estimate the probability of having been diagnosed with asthma by a health professional in past 12 months as a function of current tobacco use and other covariates among all youth. In the second part, we used multinomial regression to estimate the extent to which asthma kept youth from getting as much done at work, school, or home in past 30 days ("asthma-related productivity loss") as a function of current tobacco use and covariates among youth with asthma. We classified tobacco use status as: never tobacco use, current cigarette use without e-cigarette use, current e-cigarette use without cigarette use, current dual use of cigarettes and e-cigarettes, and other tobacco use. Covariates included sociodemographic characteristics, body mass index, smoke-free home rules, and living with a tobacco user or not. **Results:** 19.8% of youth reported having asthma in past 12 months. Among these youth, the prevalence of never tobacco use, current cigarette use, current e-cigarette use, and dual use was 25.1%, 2.2%, 3.0%, and 1.2%, respectively. Among youth with asthma, 6.1% reported productivity loss some of the time and 2.7% reported productivity loss most or all of the time. Compared to never tobacco users, current e-cigarette users were 3.8 times and current cigarette users were 4.0 times as likely to report some asthma-related productivity loss (vs. none or little of the time), and dual users were 7.8 times as likely

to report asthma-related productivity loss most or all of the time (vs. none or little of the time). **Conclusions:** Cigarette smoking, e-cigarette use, and dual use may magnify the negative impacts of asthma on youth.

FUNDING: Federal

PH-299

THE CURIOUS CASE OF UNDER-COLLECTION. THE UNEXPLAINED BRAZILIAN TAX REVENUE LOSSES

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Significance Brazil presents an exception to the uniform tobacco excise mechanism with an excise tax, IPI, and two contributions, PIS and COFINS. Recent losses in revenue collection have raised concerns that increasing tobacco taxes might further complicate this scenario given the risk of an economic recession and illicit trade. However, little analysis has been done on the components of revenue collection. This study addresses that gap and focuses on the 2017 decrease in the IPI revenue collection. Methods We analyze the revenue collection figures using official publicly available data. Using the PIS-COFINS revenue collection and the fiscal rules in Brazil we estimated the average implicit price and re-estimated the IPI collection per pack. Results Since 2003, nominal tax increases on IPI, PIS and COFINS resulted in increases in revenue collection until 2015. The IPI per pack was BRL 1.83, 1.80, and 2.03 in 2017, 2018, and 2019, respectively. If all packs were sold at the minimum legal price (BRL 5.00), then the IPI per pack would be BRL 2.00. There is a 20 percent discrepancy between observed and estimated IPI revenue collection. Part of this could be explained by the IPI credit system. The tobacco industry can subtract from its cigarette IPI obligations tax already paid in the purchasing of inputs on which IPI is also levied, mainly processed tobacco. However, accounting for the 20 percent discrepancy, revenue collection and implicit cigarette prices are still lower than market prices would dictate, which means that other factors besides the tax credit system are affecting revenues. Conclusion Analysis of the publicly available official data shows inconsistencies. The revenue per pack has decreased without explanation. A formal request for information to the Brazilian government under the freedom of information law provided no additional answers. Inconsistencies are not explained by illicit trade nor economic crisis since only data from legal sales and revenue were used. A better understanding of this issue is needed in order to effectively implement fiscal policies for tobacco products and increase control along the tobacco supply chain. More data are needed.

FUNDING: Nonprofit grant funding entity

PH-300

HEALTHCARE UTILIZATION AND EXPENDITURES ATTRIBUTABLE TO CURRENT E-CIGARETTE USE AMONG THE US ADULTS

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Significance Little is known about the impact of e-cigarette (e-cig) use on healthcare (HC) utilization and costs. This paper aims to fill the gap by estimating HC utilization and expenditures attributable to current e-cig use among the US adults (aged 18+). **Methods** We developed a structural model to quantify the excess HC utilization attributable to e-cig use, using 2015-18 National Health Interview Survey data. Four HC utilization outcomes were examined: hospital nights, emergency room (ER) visits, doctor visits, and home visits. Assuming that the impacts of e-cig use on HC utilization were through health effect, we used an "excess utilization" approach to estimate HC utilization attributable to e-cig use, which was then multiplied by the unit cost from the 2017 Medical Expenditures Panel Survey data to obtain the corresponding HC expenditures. We first estimated the HC expenditures attributable to current e-cig use (regardless of using other tobacco products (OTPs) or not) based on the models which categorized tobacco use status as current e-cig use, never tobacco use (reference group), and other group. Then we estimated the HC expenditures attributable to current poly e-cig use (using both e-cig and OTPs) based on the models which categorized tobacco use status as current poly e-cig use, never tobacco use (reference group), and other group. The difference between these two HC expenditures is the HC expenditures attributable to current sole e-cig use. **Results** Current e-cig prevalence among US adults was 3.6%, and 94.5% of current e-cig users were poly e-cig users. Current e-cig use and current poly e-cig use were associated with excess annual utilization of 5.1 and 4.9 million



hospital nights, 3.2 and 3.1 million ER visits, 24.8 and 23.8 million doctor visits, and 19.3 and 18.5 million home visits, respectively. Annual excess HC expenditures were \$26.6 billion attributable to current e-cig use and \$25.5 billion attributable to current poly e-cig use. Therefore, the annual HC expenditures attributable to current sole e-cig use was \$1.1 billion. **Conclusion** Current e-cig use was associated with substantial excess HC expenditures for hospitalizations, ER visits, doctor visits, and home visits.

FUNDING: Federal; Nonprofit grant funding entity

PH-302

CHANGES IN RECEIPT OF AND SPENDING ON SMOKING CESSATION MEDICATIONS AMONG PRIVATELY-INSURED U.S. ADULTS WHO SMOKE, BY COPD STATUS, 2010 AND 2018

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Introduction: Cigarette smoking is the leading preventable cause of chronic obstructive pulmonary disease (COPD). Smoking-attributable COPD causes over 100,000 deaths annually in the United States. Adults with COPD who smoke are more likely to receive cessation treatments than those without COPD who smoke. However, it is unknown whether receipt of, and spending on, FDA-approved cessation medications has improved when stratified by COPD diagnosis over time. **Methods:** Analysis included privately-insured tobacco users aged 18-64 years enrolled in a fee-for-service plan with prescription drug coverage in the 2010 (n=439,848) and 2018 (n=342,407) IBM MarketScan Commercial Databases. Claims for 7 FDA-approved cessation medications (nicotine gum, patch, lozenge, inhaler, and nasal spray, bupropion (150g), and varenicline) were assessed. Outcomes included changes in the proportion of tobacco users receiving any cessation medication (logistic regression), mean annual number of fills/refills and days of supply (negative binomial regression), and mean annual spending (2018 US \$) (generalized linear model). Covariates for all models included COPD diagnosis, year, a COPD-year interaction, Charlson comorbidity index score, age, sex, location, and plan type. **Results:** In 2010, the percent of tobacco users with COPD vs. without COPD receiving any cessation medications were 16.9% vs. 15.5% (difference: 1.4% points, p<0.001); in 2018, these were 24.9% vs. 15.9% (difference: 9.0% points, p<0.001), respectively. Mean annual spending on cessation medications among those with COPD vs. without COPD were \$267.8 vs. \$293.2 (difference: -\$25.4, p<0.001) in 2010, and \$529.8 vs. \$489.3 (difference: \$40.5, p<0.001) in 2018. **Conclusions:** Between 2010 and 2018, the proportion of adults who used tobacco and received cessation medications had a larger relative increase among those with COPD (42.3%) than those without COPD (2.6%). However, among adults who used tobacco, fewer than 1 in 4 received prescription cessation medications in 2018, regardless of COPD diagnosis. Opportunities exist to increase use of cessation medication to help all adults who use tobacco to quit, including those with COPD.

FUNDING: Federal

PH-303

TRENDS IN OVER-THE-COUNTER NICOTINE REPLACEMENT THERAPY SALES IN THE U.S., 2015-2019

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Significance: FDA's Center for Tobacco Products has the authority to regulate the manufacturing, marketing, and distribution of tobacco products with a goal to improve population health in the U.S. One approach is to encourage existing cigarette smokers switching to safer products. To better inform regulatory actions and to facilitate complete switching behaviors among existing cigarette smokers, it is important to understand consumers' product attribute preferences for safer nicotine alternatives. The main purposes of this study are to assess trends in dollar sales of over-the-counter (OTC) nicotine replacement therapy products (NRT) by product type (gum, patch, lozenge) between 2015 and 2019; and to examine dollar sales and market shares of NRT products for the most recent year (2019) by type, retail channel, manufacturer, brand, flavor, and nicotine strength. **Methods:** This study used Nielsen Retail Measurement Services (RMS) data to examine national trends in OTC NRT dollar sales over five years (2015-2019) and dollar sales by product attributes for the most recent year available (2019). **Results:** OTC NRT market sales totaled over \$1 billion annually in 2019, with gum sales accounting for about half the market (\$533 million (M), 52.9%), lozenge sales one-third (\$324M, 32.1%), and patch sales for the remainder (\$151M, 15.0%). Across the five-year period, sales of NRT gum and patches have decreased while sales of lozenges, including mini-lozenges, have increased. Drug stores were the retail channel accounting for the largest percentage of total OTC NRT sales (41.6%) in 2019. Three leading brands - private label, i.e., store brands (61.5%), Nicorette®

(31.7%), and NicoDerm® CQ (5.9%) - accounted for 99.1% of total OTC NRT market sales in 2019. Mint was the most common flavor of OTC NRT gum and lozenge sales (41.5% and 73.7%, respectively) in 2019. **Conclusions:** This research on product sales reflect consumers' product preferences for OTC NRT. Examining NRT sales trends by product type and attributes can help regulators better understand preferences among consumers when considering regulations.

FUNDING: Federal

PH-304

DEVELOPMENT OF A SMARTPHONE APP TO MEASURE ELECTRONIC CIGARETTE DEVICE AND LIQUID CHARACTERISTICS

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INTRODUCTION: Electronic cigarettes (ECIGs) heat a nicotine-containing liquid to produce an inhalable aerosol. ECIG power (wattage) and liquid nicotine concentration are two factors that predict nicotine emission rate ("flux"). However, many ECIG users do not know how these factors interact to influence nicotine exposure. We asked ECIG users about their device wattage and liquid nicotine concentration and also attempted to gather this information objectively as part of the development of an app intended to calculate nicotine flux from photographic input. **METHODS:** Past 30-day ECIG users (n=84; mean age=23.8 years [SD=9.6]) reported device/liquid characteristics. ECIG device power was measured via multimeter, device display screens, or obtained via labeling. Liquid nicotine concentration was obtained via labeling or through chemical analysis. **RESULTS:** Participants presented with 152 devices (88 unique). Of participants' 84 primary devices, 13.1% were "prefilled disposable/cig-alike", 2.4% "vape pen/eGo style", 40.5% "rebuildable/box mod", and 40.5% "pod mod"; 3.6% were "other". Most participants (65.5%) reported not knowing their primary device wattage. Rebuildable/box mods had the greatest power range (1-324 watts); pod mod power also varied considerably (6-40 watts). Most participants (95.2%) reported knowing their liquid nicotine concentration, which ranged from 3-60 mg/ml. Holding all other factors constant, and using the mean nicotine concentration of 8.31 mg/ml, possible box mod flux ranged from 1.66 to 538.68 µg/sec. For pod mods, using the mean concentration of 47.0 mg/ml, flux ranged from 56.42 to 376.13 µg/sec. **CONCLUSIONS:** ECIGs are a heterogeneous product class and many users are unaware of device/liquid characteristics that affect nicotine and other toxicant emissions. These results highlight how ECIGs within a broad category can vary considerably in nicotine flux, and thus likely abuse liability and potential as a cigarette substitute. A smartphone app that uses image capture technology to account for product heterogeneity and nicotine flux variability can be used in survey studies intended to inform ECIG regulation.

FUNDING: Federal

PH-305

ARE THERE GENERATIONAL DIFFERENCES IN PREDICTORS OF QUIT ATTEMPTS AND SMOKING ABSTINENCE. FINDINGS FROM THE 2016 AND 2018 ITC FOUR COUNTRY SMOKING AND VAPING SURVEYS

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Significance: Previous work indicated that the predictive relationships between measures of dependence and short-term smoking abstinence may vary by age. This paper explores possible age differences in other key theoretical predictors of making a quit attempt and successful short-term smoking abstinence: motivation, planning to stop and self-efficacy. **Methods:** Data are from 3661 adult daily smokers (all non-daily vapers) who participated in the 2016 and 2018 International Tobacco Control Four Country Surveys. A series of multivariable logistic regression models assessed the moderating effect of age (split at 40 years) on the association of planning to quit, wanting to quit, and quitting self-efficacy with quit attempts and at least 1-month smoking abstinence. All models adjusted for socio-demographics and measures of dependence. **Results:** 1545 (42%) of the participants reported a quit attempt by 2018. Reported 2016 wanting to quit (e.g. a lot: aOR= 4.99, 95% CI=3.21-7.76, p<0.000) and planning (e.g. within



one month: aOR =7.35, 95% CI=4.98-10.86, $p < 0.000$) were associated with 2018 reported quit attempts. None of the predictors showed significant interactions with age. Among quit attempters, 564 (37%) reported abstaining smoking for at least 1-month. Not wanting to quit and higher perceived quitting self-efficacy at 2016 survey were both significantly associated with 1-month smoking abstinence. There was also a significant age by plan to quit interaction (aOR =0.88, 95% CI=0.78-0.99, $p < 0.05$). Age stratified analysis confirmed that planning to quit was associated with smoking abstinence in the younger age group but this association was reversed in the older age group (e.g. plan to quit 1-6 months: age < 40 aOR=3.49, 95% CI=1.14-10.69, $p < 0.05$), age 40+ aOR=0.45, 95% CI=0.24-0.84, $p < 0.05$). Not wanting to quit (e.g. a lot: aOR=0.021, 95% CI=0.07-0.67, $p < 0.01$) and higher self-efficacy (aOR=1.22, 95% CI=1.07-1.39, $p < 0.01$) were both associated with 1-month smoking abstinence in the older age group only. **Conclusions:** These analyses suggest that there are age related differences in predictors of making a quit attempt and short-term smoking cessation maintenance.

FUNDING: Federal

PH-306

AN INITIAL INVESTIGATION OF THE ENDS NICOTINE DEPENDENCE SCALE AMONG NEW YORK STATE SMOKERS' QUITLINE CALLERS

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Significance: As the use of electronic nicotine delivery systems (ENDS) has increased, the number of callers to the New York State Smokers' Quitline (NYSSQL) seeking to discontinue ENDS use has increased. Nicotine dependence (ND) level is critical to treatment planning and nicotine replacement dosing, but there is no well-validated measure of ND for ENDS users. This initial investigation examined correlations between the ENDS Nicotine Dependence Scale (ENDS-NDS) and the Penn State E-Cigarette Dependence Index (PSE) and salivary cotinine level, a biomarker of nicotine intake correlated with ND. **Methods:** ENDS users who contacted the NYSSQL were administered the 8-item ENDS-NDS (range 0-16) and the 10-item PSE (range 0-20). Saliva samples (100ul) were collected within 2 weeks of initial contact and analyzed using liquid chromatography with tandem mass spectrometry. Pearson correlations were used to examine the correlations between total ENDS-NDS and PSE scores and cotinine level. **Results:** Participants with analyzable samples (84%; n=42) were 67% men and 62% White, mean age 39; 67% were unemployed; 93% were current or past cigarette smokers; 48% reduced ENDS and other tobacco use in the last 30 days; and 50% started nicotine replacement therapy prior to providing the saliva sample. Mean ENDS-NDS score was 11.1 (SD 2.1, range 6-15); mean PSE score was 10.1 (SD 2.7, range 4-15). The ENDS-NDS and PSE scores were not significantly correlated, $r(41) = .19, p = .46$. The ENDS-NDS score was significantly correlated with cotinine level ($r(41) = .32, p < .05$); the PSE was not ($r(41) = .08, p = .62$). **Conclusions:** Among NYSSQL callers, most of whom were current or former cigarette smokers, the brief ENDS-NDS was significantly associated with cotinine level, an important biomarker of nicotine intake, ND, and the appropriate dosing of nicotine replacement. Future research will seek to replicate these findings with a larger sample size and conduct item-level psychometric analyses.

FUNDING: Unfunded

PH-307

ENDORSEMENT OF NICOTINE DEPENDENCE MOTIVES AMONG ELECTRONIC CIGARETTE USERS: FINDINGS FROM THE PATH STUDY

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Significance: Electronic cigarette (e-cigarette) users develop nicotine dependence (ND), but studies on the motives of e-cigarette ND are scarce. **Methods:** We used the Population Assessment of Tobacco and Health (PATH) survey to assess the motives of ND among adult e-cigarette only users, and compared them to cigarette only smokers. We identified 142 'e-cigarette only' past 30-day users and 2,757 cigarette only smokers in Wave 1 and followed them longitudinally throughout Wave 4 to assess the changes in their endorsement of 22 ND questions using repeated measures analysis of variance. **Results:** Among e-cigarette only users, we found significant endorsement increases ($p < .05$) in several ND questions over time that capture existing ND motives. These questions include 'consider to be addicted,' 'e-cigarettes control me,' 'use is out of control,' 'hard to stop using,' 'hard to stop using for a week,' and 'difficulty not using

e-cigarettes in places where it was prohibited,' (representing the "autonomy" motive); 'frequently crave,' 'urges keep getting stronger,' 'want to use right after waking,' 'helps feeling better if feeling down,' 'use to feel less restless and irritable,' 'use not to experience any discomfort,' 'can go only couple of hours without using,' (representing "negative reinforcement"); 'self-reaching for e-cigarettes without thinking about it,' 'frequently use without thinking about it,' 'most people I spend time with are tobacco users,' and 'feel alone without e-cigarettes,' (representing "cognitive and social learning"). 'Smoking helps me think better' (representing "positive reinforcement") did not change significantly over time among e-cigarette users, while endorsement increased among cigarette smokers. Levels of endorsement of all ND questions were higher among cigarette smokers than among e-cigarette users. **Conclusion:** Endorsement of ND motives differs between e-cigarette users and cigarette smokers. Given increased e-cigarette use in the U.S., an understanding of the endorsement of nicotine dependence motives among e-cigarette users would contribute to developing appropriate e-cigarette-specific cessation interventions.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PH-308

UNDERSTANDING SENSORY DEPENDENCE IN VAPERS: EXPLORING THE SENSORY E-CIGARETTE EXPECTANCY SCALE (SEES) WITH A NEW SAMPLE OF DIVERSE COLLEGE VAPERS

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Significance: With increasing use of vaping devices and electronic nicotine delivery systems (ENDS), younger individuals may be attracted to sensory characteristics and this may be related to becoming dependent on these devices. The purpose of this study was to explore a current assessment of sensory dependence on young adult vapers and examine this assessment across multiple substances. **Methods:** Data were collected in April, 2020 via an online survey of nicotine/tobacco use and ENDS use from students at Northeastern Illinois University, a non-traditional, Minority Serving Institution in Chicago, IL. We assessed ENDS/substance use over the past 30 days, lifetime use, and sensory dependence using the Sensory E-cigarette Expectancies Scale (SEES). The SEES uses 9 Likert scale items (range 1-5) where total scores are calculated by taking the average of the sum of all item scores. The SEES assess sensory expectancies across 3 factors of taste/smell, pleasure from vaping, and vapor clouds. We tested this 3-factor structure on the current sample with confirmatory factor analysis. Fit indices include chi-square, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Root Mean Square Residual (SRMR). **Results:** 18% of students (N=153) have used ENDS. They were mostly women (69%), White (59%), and had an average age of 26 years (SD=6.4), where 40% were Hispanic or Latino. 10% (N=85) reported current vaping, where 4% (N=33) were ENDS-only users, 5% (N=40) were marijuana-only vapers, and 2% (N=12) were dual vapers. For all current vapers, the average SEES score was 2.4 (SD = 0.99) and confirmatory factor analysis showed some acceptable fit indices ($\chi^2(24): p < .001$, RMSEA=0.097, CFI=0.96, SRMR=0.046). When controlling for type of substance used in vaping devices, we included both current and lifetime vapers due to small sample size. Here, the model showed similar fit indices for ENDS-only users ($\chi^2(24): p < .05$, RMSEA=0.093, CFI=0.970, SRMR=0.055) and for marijuana/dual vapers ($\chi^2(24): p = 0.08$, RMSEA=0.083, CFI=0.978, SRMR=0.045). **Conclusions:** In a small sample of diverse young adult vapers, this model of sensory dependence may not differentiate sensory dependence across different substances used in vaping devices. It may reveal the importance of how much sensory dependence is based on sensations generated from the device separately from the substance used. It is vital that future research explore whether these sensory factors and limitations address all relevant features of vaping and ENDS use and whether these assessments can predict problematic vaping.

FUNDING: Federal; Academic Institution



PH-309

IMPLEMENTATION OF A COMPREHENSIVE TOBACCO FREE WORKPLACE PROGRAM IN AGENCIES SERVING THE HOMELESS AND VULNERABLY HOUSED

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SIGNIFICANCE: Although tobacco use is exceedingly high among those who are homeless or vulnerably housed (>70%), interventions are rarely provided to this group despite their interest in quitting. Tobacco-free workplace programs, like Taking Texas Tobacco Free (TTTF), are evidence-based, tobacco control initiatives that may be effective in increasing capacity to address tobacco use within homeless serving community agencies by addressing known clinician barriers to intervention. Here, we examine the outcomes of TTTF's implementation within 4 agencies in Austin and Houston, TX, that provide housing or other services to 23,405 unique individuals/guests-in-residence (through 93,208 annual contacts) who are homeless or vulnerably housed. **METHODS:** TTTF's implementation included basic tobacco education for staff, specialized training for clinicians to screen for and treat tobacco use (e.g., Certified Tobacco Treatment Specialist training; CTTS), nicotine replacement therapy (NRT), and tailored passive dissemination materials. Pre- and post-implementation data were collected from clinicians (N=68) to assess changes in training receipt, knowledge, and intervention behaviors. **RESULTS:** Results indicated significant gains in clinicians' receipt of training in 9 (of 9) target areas ($p < 0.0042$) and a 53% knowledge gain ($p < 0.0001$). Overall, 41 clinicians attended a Motivational Interviewing training and 5 clinicians attended CTTS training to better motivate and assist quit attempts. From pre- to post-implementation, there were mean increases in the use of the 5A's (ask, advise, assess, assist, and arrange) and other evidence-based interventions for tobacco cessation, with significant gains seen over time in assisting residents/clients to quit, arranging follow-ups, and providing or referring for non-nicotine medications ($p < 0.0491$). The 1 agency with direct treatment capacity conducted 3,195 tobacco use assessments and distributed NRT to 265 adults attempting to quit. **CONCLUSIONS:** Overall, TTTF improved clinicians' capacity to address tobacco use among homeless and vulnerably housed individuals and may serve as a model for tobacco control efforts in similar agencies.

FUNDING: Federal; State

PH-310

E-LIQUIDS WITH THE SAME MARKETED FLAVOR FROM DIFFERENT BRANDS ARE EQUALLY LIKED

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Significance: Hundreds of different e-liquid flavors are available from different brands. Variety of e-liquid flavors is an important reason for e-cigarette use, particularly among youth. To prevent e-cigarette use among youth, flavor variety can be reduced by, for example, banning particular flavor categories such as fruit and candy. Although this would limit overall flavor variety, between-brand varieties would still exist within the remaining categories, and could even be increased in reaction to such a ban. It is unknown how varieties between brands differ in liking of e-liquid flavors. Therefore, this study investigates differences in liking between e-liquid brands with the same flavor label. **Methods:** Forty adults (35% men; mean age 36.8 ± 9.8) smelled 24 nicotine-free e-liquids from 8 different marketed flavors (e.g. tobacco, custard, watermelon; 3 products each). Participants rated liking, intensity, familiarity, and irritation on a 100 mm Visual Analogue Scale, and ranked the 3 products with the same flavor label on their fit with the flavor label. ANCOVA and post hoc tests were used to evaluate differences in ratings between brands and flavors; ranking results were analyzed using a chi-squared test. **Results:** Liking did not differ between brands with the same flavor label. Within all flavors except cherry, participants were equally familiar with the three product's odors. However, one of the three products was more often rated as suiting the flavor label best for tobacco, cherry, custard, and cola, and least for watermelon. Overall, sweet flavors (cherry, watermelon, custard, mojito, and cola) were liked more than chocolate and the typical non-sweet flavors coffee and tobacco. **Conclusions:** To limit e-cigarette appeal, regulators could consider banning sweet flavors (such as cherry, watermelon, custard, mojito, and cola). Products with the same flavor label were equally liked, suggesting that reducing variety of e-liquid flavors on the market may reduce the number of e-liquids liked by potential consumers. This provides support for regulation of specific e-liquid flavor categories in order to reduce e-cigarette appeal and use among youth.

FUNDING: State

PH-311

RAPID DEVELOPMENT OF A SENSITIVE METHOD TO MEASURE NICOTINE IN BRONCHOALVEOLAR-LAVAGE FLUID (BALF) BY ACETONE PRECIPITATION COMBINED WITH ISOTOPE DILUTION LIQUID CHROMATOGRAPHY-TANDEM MASS SPECTROMETRY (LC/MS/MS)

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Introduction: During 2019, there is a national outbreak of e-cigarette, or vaping, product use-associated lung injury (EVALI) 1. The bronchoalveolar-lavage fluid (BALF) can be part of the clinical and diagnostic workup of EVALI patients. BALF samples were collected August-December 2019 and sent to the Centers for Disease Control and Prevention (CDC) for analysis 1. BALF samples were collected from seriously ill patients; this available sample volume was sometimes limited, and simple yet sensitive methods were required for nicotine measurement in BALF. There isn't any LC/MS/MS method to measure nicotine in BALF matrix in current literature. Methods: We used one step acetone precipitation in a 96 well plate format for extracting nicotine from BALF. By optimizing liquid chromatography conditions, mobile phase, column temperature and mass spectrometry parameters, we rapidly developed and validated an isotope-dilution LC/MS/MS method for measuring nicotine in 40 µL of BALF. Accuracy was measured by recovery of two pools of BALF spiked at three concentrations for two days, and precision was evaluated using two pools measured ten times over three days. Results: The one step clean-up and 96 well plate format had a throughput of 400 samples per day. The intraday and inter-day imprecision and bias are less than 10%. The limits of detection of nicotine in BALF is 0.050 ng/mL. The method was applied to samples from 47 EVALI case patients and 99 healthy comparators (non-users, e-cigarette users, and cigarette smokers) 1. References 1. Blount, B. C.; Karwowski, M. P.; Shields, P. G.; Morel-Espinosa, M.; Valentin-Blasini, L.; Gardner, M.; Braselton, M.; Brosius, C. R.; Caron, K. T.; Chambers, D.; Corstvet, J.; Cowan, E.; De Jesus, V. R.; Espinosa, P.; Fernandez, C.; Holder, C.; Kuklenyik, Z.; Kusovschi, J. D.; Newman, C.; Reis, G. B.; Rees, J.; Reese, C.; Silva, L.; Seyler, T.; Song, M. A.; Sosnoff, C.; Spitzer, C. R.; Tevis, D.; Wang, L.; Watson, C.; Wewers, M. D.; Xia, B.; Heitkemper, D. T.; Ghinai, I.; Layden, J.; Briss, P.; King, B. A.; Delaney, L. J.; Jones, C. M.; Baldwin, G. T.; Patel, A.; Meaney-Delman, D.; Rose, D.; Krishnasamy, V.; Barr, J. R.; Thomas, J.; Pirkle, J. L.; Vitamin E Acetate in Bronchoalveolar-Lavage Fluid Associated with EVALI. The New England journal of medicine 2020;382(8):697-705.

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PH-312

VIEWS OF ROMANIAN PREGNANT SMOKERS AND EX-SMOKERS ON THE USE OF E-CIGARETTES AND HEAT-NOT-BURN PRODUCTS

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Significance: Despite the insufficient evidence on the safety of Electronic cigarettes (EC) and Health-Not-Burn products (HNBP), these are increasingly being used by smoker pregnant women as an alternative to regular cigarettes. Most studies on pregnant women's views on this topic have been conducted in the US and UK. Our aim is to explore the views of Romanian pregnant smokers and ex-smokers on the use of ECs and HNBP. **Methods:** Semi-structured telephone interviews (N=23) and online focus groups (N=2) were conducted with 30 Romanian pregnant smokers and ex-smokers of regular tobacco products recruited via Facebook Ads in May 2020. Women self-assessed their eligibility (18 or older, pregnant, smokers/ex-smokers) by filling an online form, signed an informed consent, provided their contact details, and filled out an 8-question screening survey. We conducted descriptive statistics on the survey and a hybrid deductive-inductive thematic analysis on the verbatim transcripts of the audio recordings. **Results:** Women had a mean age of 29.4 (range 20-44, SD=5.22) and reported a mean pregnancy week of 21.9 (range 5-36, SD=8.01), 90% were from urban areas, 43.3% had a high school degree or less, and 46.3% were current tobacco users. From the 30 women, 10% (N=3) were ever users of ECs, 40% (N=12) of HNBP, and 20% (N=6) of both. Five themes emerged from our analysis: pros and cons of use; harm perceptions (i.e. seen as less harmful than regular cigarettes; viewed as safe to use in closed and open public space); lack of knowledge (i.e. no knowledge on safety, nicotine dependence); regulations (i.e. they should comply with the same distribution and advertising legislation as regular cigarettes); need for customer information (i.e. no information available for users except from that at selling points). **Conclusion:** Women viewed regular cigarettes, ECs, and HNBP as harmful to health, with ECs being less harmful than regular cigarettes but more harmful than HNBP. Most long-term users of



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ECs and HBNP returned to the use of regular cigarettes. There was a general agreement regarding the lack of knowledge concerning these products and the need for evidence-based consumer advice.

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PH-313

BOTH NON-SMOKING YOUTH AND SMOKING ADULTS LIKE SWEET AND MINTY E-LIQUID FLAVORS MORE THAN TOBACCO FLAVOR

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Significance: Smokers may reduce their health risk by switching to e-cigarette use. However, as e-cigarette use is not harmless, their use by those who currently do not smoke, particularly youth, is better prevented. E-liquids are available in a high variety of flavors, contributing to e-cigarette appeal. E-liquid flavors could be regulated to reduce appeal and thereby use among youth, ideally in a way that the flavors attractive to smokers remain available. This study aims to determine which flavors are attractive to specific user groups by comparing sensory liking of e-liquid flavors between adolescent non-smokers, young adult non-smokers, and adult smokers. **Methods:** Adolescent non-smokers (n=41; mean age 16.9±0.8), young adult non-smokers (n=42; mean age 22.7±1.7), and adult smokers (n=56; mean age 39.7±11.1) smelled various tobacco (n=6) and non-tobacco (n=24) flavored e-liquids, dissolved in demi water. Participants rated odor liking on a 9-point labeled hedonic scale, and familiarity, intensity, sweetness, bitterness, and irritation on a 100-mm Visual Analog Scale. We compared ratings between groups and flavors. **Results:** Overall, mean liking ratings ranged from 2.3 (whiskey) to 6.7 (peppermint). Liking did not differ between the groups for all products, except for two tobacco-flavored e-liquids that were liked less by the group of adolescent non-smokers. For all groups, typically sweet and minty flavors (e.g., wine gum, bubblegum, watermelon, cola, vanilla, citrus, mojito, peppermint, menthol) were liked more than the 6 tobacco-flavored e-liquids. Liking correlated positively with sweetness (R = 0.49) and familiarity (R = 0.48), and negatively with bitterness (R = -0.58), irritation (R = -0.47), and intensity (R = -0.27). **Conclusions:** Sweet and menthol/mint-flavored e-liquids are liked equally by youth non-smokers and adult smokers, and more than tobacco flavors. Thus, banning all e-liquid flavors except tobacco will reduce appeal of e-cigarettes, for adult smokers and youth alike. More research is needed to determine whether tobacco flavors alone are sufficient for smokers to permanently switch towards e-cigarettes.

FUNDING: State

PH-314

ESTIMATING ALL-CAUSE AND CAUSE-SPECIFIC MORTALITY RISK FOR SMOKERS AS A FUNCTION OF TIME SINCE QUITTING

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SIGNIFICANCE: Cigarettes are addictive and pose a significant health risk. In this study, we estimated relative mortality risk as hazard ratios (HRs) among US adults (aged 35+) for current and former smokers as a function of years since quitting (q). HRs were estimated by sex, 10-year age groups, and cause of death, using the National Health Interview Survey Linked Mortality Files with mortality follow-up through December 31, 2015, survey years 1997-2015. **METHODS:** We estimated HRs for current (q=0) and former smokers (q>0) using a two-stage Cox proportional hazard model adjusted by race/ethnicity, education, BMI, poverty level, preexisting health condition, and alcohol use. At the first stage, we estimated HRs for current compared to never smokers. At the second stage, we estimated HRs for former compared to current smokers including q as a predictor variable. HRs for former smokers as a function of q were calculated as the product of the HRs estimated in the two stages. Models were fitted considering a maximum of 10-year mortality follow-up. **RESULTS:** For all-cause mortality, HRs for male current smokers vary from 1.3 (95% CI: 1.2-1.6, age 35-44) to 2.3 (95% CI: 2.1-2.6, age 55-64), while for females vary from 1.7 (95% CI: 1.4-2.1, age 35-44) to 2.5 (95% CI: 2.3-2.7, age 65-74). For males aged 45-54, the % reduction in mortality risk after q=5, 10 and 15 years of cessation, compared to q=0, was 13.4%, 25.1% and 35.1%, respectively; while for females was 20.3%, 36.5% and 49.3%, respectively. For males aged 75-84, the % reduction after 5, 10 and 15 was 7.3%, 14.1% and 20.4%, respectively; while for females it was 8.6%, 16.5% and 23.7%, respectively. For smoking-related diseases (heart, neoplasms, respiratory, cerebrovascular, diabetes, pneumonia), the % reduction after 5, 10 and 15 years of cessation among males aged 45-54 was 22.5%,

39.9% and 48.5%, respectively; while for females it was 19.9%, 35.9% and 48.8%, respectively. **CONCLUSIONS:** Mortality HRs for former smokers decreased with time since quitting and can be modeled using the proposed two-stage Cox proportional model. These findings provide updated mortality risk estimates to support regulatory activities.

FUNDING: Federal

PH-315

SOCIOCULTURAL FACTORS AND E-CIGARETTE DEPENDENCE AMONG CIGARETTE-SMOKING ADULTS

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Significance. There are sociocultural differences in cigarette use, cigarette dependence, and e-cigarette use; however, little is known about sociocultural factors and e-cigarette dependence. Thus, our aims were to: 1) compare sociocultural factors between individuals who smoke cigarettes and endorse medium/high dependence versus no/low e-cigarette dependence; and 2) examine whether e-cigarette dependence is associated with sociocultural factors by smoker type (dual user versus solo e-cigarette user) among a nationwide sample of US adults. **Methods.** This was a secondary analysis from a study that investigated adult e-cigarette use recruited from an online workforce (Qualtrics). Self-reported sociocultural factors were: age, biological sex, sexual orientation, race/ethnicity, education, marital status, income, and employment status. Current e-cigarette dependence was measured with the Penn State E-Cigarette Dependence Index (≤ 8 =none/low dependence; ≥ 9 =medium/high dependence). **Results.** Ninety participants were included in our sample (50% male, 53% White). More participants with e-cigarette use reported medium/high e-cigarette dependence (59%) than none/low dependence (41%). Sociocultural factors did not differ between the dependence groups ($p > .05$). More participants were dual users (78%) compared to solo users (22%), and sociocultural factors were similar between the use groups ($p > .05$). When participants were categorized as White or non-White, race did not distinguish e-cigarette dependence nor smoker type. **Conclusion.** Among e-cigarette users, more adults reported e-cigarette dependence (vs. no dependence) and dual use of e-cigarettes and cigarettes (vs. solo e-cigarette use). Adults with e-cigarette dependence were similar in demographics to adults without e-cigarette dependence, in contrast to differences previously found among cigarette users, highlighting that it may be important for e-cigarette dependence interventions to be suitable for people of many backgrounds. Further, non-sociocultural factors may better distinguish individuals with vs. without e-cigarette dependence, and identifying these factors may help to understand who is at greater risk for e-cigarette dependence.

FUNDING: Unfunded; Academic Institution

PH-316

ELECTRONIC NICOTINE DELIVERY SYSTEMS POINTS-OF-SALE PROXIMITY TO SCHOOLS IN ISRAEL

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Significance Exploring the proximity of Electronic Nicotine Delivery Systems (ENDS) points-of-sale (POS), to schools is critical for understanding ENDS marketing to youth, informing policy and enforcement, and protecting youth. This study examined physical proximity of ENDS, specifically IQOS (currently the only heated tobacco product sold in Israel) and JUUL (leading electronic cigarette sold in Israel at the time) POS, with respect to schools in Israel and in relation to neighborhood socioeconomic status (SES). **Methods** Geospatial statistical analysis was performed using data from 1) the Israeli Ministry of Education, which provides locations of all schools with grades one through twelve, in Israel (08/2017); and 2) IQOS and JUUL websites, which provide locations of all IQOS/JUUL POS in Israel, respectively (06/2019). The number of ENDS POS were mapped within walking distance (1 kilometer [km]) of each school. Using a distance matrix, we calculated distance from each school to the nearest POS. We analyzed schools' proximity to the POS stratified by surrounding neighborhood SES ranking. **Results** An average of 8.7 IQOS POS and 5.2 JUUL POS were found within a radius of 1 km from schools. The average distance from schools to the nearest POS of IQOS and JUUL was 954 m (median=365 m) and 1,535 m (median=579 m), respectively. The percent of schools with an IQOS or JUUL POS within a 1 km radius were 86% and 74%, respectively. The average number of POS within 1 km of schools in low, middle, and high SES neighborhoods were 7.5, 9.9, and 7.6 for IQOS and 4.1, 5.9, and 5.5 for JUUL, respectively. Median distances from schools in low, middle, and high SES neighborhoods to nearest POS were 428 m, 325 m, and 403 m for IQOS and 1,044



m, 483 m, and 525 m for JUUL. **Conclusions** A high proportion of ENDS POS were found to be in proximity to schools. Assuming access and exposure may influence ENDS use, these findings underscore the need to consider POS ban on selling ENDS in proximity to schools in Israel.

FUNDING: Federal

PH-317

PERCEPTIONS OF TOBACCO PRODUCT-SPECIFIC COVID-19 RISK AND CHANGES IN TOBACCO USE BEHAVIORS AMONG SMOKERS, E-CIGARETTE USERS, AND DUAL USERS

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Introduction: The COVID-19 pandemic is a critical public health threat, but its effects on tobacco use behaviors remain ill-defined. This study aimed to assess the relationship between tobacco product-specific COVID-19 risk perceptions and changes in tobacco use since the pandemic began. **Methods:** A cross-sectional online survey (n=990) of past-30 day exclusive cigarette smokers (n=275), exclusive e-cigarette users (n=174), and dual users (n=541) was conducted using Amazon's Mechanical Turk from April 27 to June 8, 2020. Unadjusted differences between tobacco user groups and tobacco product-specific COVID-19 risk perceptions (e.g., smokers are at higher/lower risk for COVID-19 than non-smokers), demographics, health status, and tobacco product characteristics were assessed using bivariate analyses (chi-squares and t-tests). Adjusted associations between tobacco product-specific COVID-19 risk perceptions and self-reported subjective changes in tobacco use were assessed among exclusive users (the two groups were pooled together) using linear regressions and among dual users using linear mixed effects models. Covariates used in both models included the tobacco product being assessed (cigarette or e-cigarette), demographics, overall perceptions of one's own physical and mental health, use of flavored tobacco products (menthol cigarettes or flavored e-liquid solutions), and the average amount of money respondents spent on tobacco products per week in 2019. **Results:** For exclusive users (B=-0.17) and dual users (B=-0.14), higher COVID-19 risk perceptions for users of cigarettes and e-cigarettes (relative to non-users) were associated with reductions in the use of those products since the pandemic began (ps<0.01). Dual users were more likely to have increased their e-cigarette use relative to their cigarette use since the pandemic started (B=0.09; p<0.05). **Conclusions:** These findings provide initial support that tobacco product-specific COVID-19 risk perceptions are an important correlate of changes in tobacco use during the COVID-19 pandemic. Targeted information for smokers and e-cigarette users regarding their COVID-19 risk is needed during this public health crisis.

FUNDING: Federal

PH-318

BENZO[A]PYRENE IN THE MAINSTREAM SMOKE OF LITTLE CIGARS

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Little cigars are similar to conventional cigarettes with respect to dimensions, filters and overall appearance. They are also known to be used as substitutes for cigarettes by consumers. Comparison of little cigars with cigarettes is relevant to understanding their respective public health impacts. To understand their relative toxicities, the mainstream smoke yields of benzo[a]pyrene (B[a]P), a human carcinogen, were measured for 60 commercial little cigar products. The little cigars were smoked on a linear machine using the International Organization of Standardization (ISO) non-intense and Canadian Intense (CI) smoking regimens followed by analysis with a validated GC/MS method. The analytical variability of little cigars and previously tested commercial cigarettes was similar (% RSD 9.6 vs. 14.5, respectively), enabling informative direct data comparisons. ISO B[a]P yields ranged from 14.5 - 44.0 ng/cigar and CI yields from 24.0 - 65.7 ng/cigar. The mean ISO yield is 25.5 ng/cigar versus CI yield of 42.2 ng/cigar, which are 2.5 and 2 times greater, respectively, than cigarette yields. Because little cigars generally contain more tobacco than cigarettes (767 - 1,367 mg versus 379 - 956 mg), the ISO and CI B[a]P yields of cigars and cigarettes were normalized to tobacco weight. Even after normalization, B[a]P yields of little cigars are 1.5 (ISO) and 1.3 (CI) times greater than cigarette yields. B[a]P smoke yields are known to correlate with tobacco weight. B[a]P yields show similar correlations with tobacco weight for both little cigars (CI, R² =

0.35) and cigarettes (CI, R² = 0.31). Therefore, little cigars, although similar to cigarettes as noted above, differ in smoke chemistry by generating higher B[a]P yields, even when normalized to tobacco weight. This work was funded by the Interagency Agreement, ID number 224-10-9022, between the Food and Drug Administration and the Centers for Disease Control and Prevention. The authors have no competing financial interests.

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PH-319

ASSOCIATION BETWEEN TOBACCO RETAIL DENSITY AND PREVALENCE OF SMOKING, VAPING IN CALIFORNIA

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Introduction: Access to tobacco products including Electronic Nicotine Delivery Systems (ENDS) from various tobacco storefronts influence the incidence of alternative and combustible tobacco product use. Identifying the variation in this association between retail density of specialized tobacco and/or vape shops and non-specific vendors can help optimize regulatory measures in tobacco control. **Objectives:** To analyze the variation in the association between tobacco retail store category and smoking prevalence in comparison with vaping prevalence. **Methods:** Licensed tobacco retailers in California were categorized into tobacco- and/or vape-specific storefronts and non-specific vendors based on the CDTFA (California Department of Tax and Fee Administration) publicly available license listings. The store categorization was cross-referenced using Yelp, a crowd-sourcing business directory service. A series of simple linear regression tests were performed between the number of vendors under each store category and smoking population and was compared with vaping population at the zip code level. **Results:** The association between smoking population and number of tobacco retailers was statistically significant for all store categories. Non-specific storefronts had the highest proportion of variability in the number of storefronts explained by smoking population (R²=0.74). Vape and tobacco as well as tobacco-only storefronts had the lowest proportion of variability in the number of storefronts explained by smoking population (R²=0.23). Similar results were obtained for the vaping population, although the proportion of variability in the number of non-specific storefronts explained by vaping population was lower compared to smoking population (R²=0.47). **Conclusions:** Ease of access to tobacco products from a non-specific storefront is higher for an average smoker as well as those who use ENDS. Smoking and vaping prevalence can be reduced through regulations targeting specific tobacco initiation, marketing, and user uptake characteristics related to non-specific storefronts selling tobacco products. Future research should aim at identifying other risk factors of exposure to tobacco product access in the context of different types of tobacco retailers, including the impact of transition of use between different products and tobacco use behavior.

FUNDING: State

PH-320

VISUALIZING TRANSITIONS FROM SMOKING TO VAPING: AN INTENSIVE DAILY DIARY INVESTIGATION USING SMARTPHONE SURVEYS

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SIGNIFICANCE: Electronic nicotine delivery systems (ENDS) have diffused rapidly and enabled some smokers to transition completely from smoking to exclusive ENDS use. However, dual-use of ENDS and smoked tobacco remains common and poorly understood. Despite ENDS' popularity, knowledge of the in-depth temporal dynamics of transitions from smoking to vaping remains limited. To address this gap, we used an intensive daily diary approach to examine smoking and ENDS use patterns over an extended time-period. **METHODS:** Forty-five community-dwelling adults (ages 19-56, 42% men, 30% Māori) interested in quitting smoking were given an ENDS and surveyed about their smoking and vaping every day for up to 20 weeks using smartphone-based daily diary surveys. We visualized and described patterns of smoking only, dual use, ENDS use only, or abstinence at the daily level and weekly level. **RESULTS:** Most participants (96%) rapidly adopted a weekly dual use pattern, which reduced to 69% by week 12. By the time they exited the study, 69% were weekly dual users, 21% were vaping only, 5% were abstinent from smoking and vaping, and 5% reverted to smoking only. Participants frequently switched between dual use and vaping only, and exhibited considerable variability over time. The median time taken to become smoke-free was 11 weeks. Most participants, including dual users, reduced their smoked tobacco con-



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sumption over time. **CONCLUSIONS:** Participants' journeys from smoking to vaping varied; many people fluctuated between smoking and vaping, suggesting dual use may be both normal and dynamic. Further analysis of factors associated with rapid transition could inform advice offered to smokers wishing to switch to vaping. In the meantime, smokers should be advised that ENDS adoption may require perseverance; because variation is the norm, they should also understand that non-linear progress from smoking to exclusive ENDS use is normal.

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PH-321

NICOTINE USE IN A GLOBAL PANDEMIC: QUALITATIVE THEMES FROM YOUNG ADULTS

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Significance: The COVID-19 outbreak has indirectly impacted tobacco user's behaviors. In one-on-one interviews, young adults described how the pandemic influenced their current attitudes and behaviors around tobacco use. **Methods:** A convenience sample of young adults ages 21-28 (n=29) were recruited online between May-August 2020 to participate in semi-structured interviews about tobacco and nicotine use behaviors specific to cigarillos and e-cigarettes. Samples were drawn among individuals who had never used tobacco or nicotine products (n=7) and current users (n=22). Audio-recorded interviews were 60-90 minutes long and were conducted remotely. Participants were asked opinions and behavioral effects of the 2020 Coronavirus pandemic on tobacco and nicotine use. Verbatim transcripts and field notes from each interview were coded by a trained researcher using a codebook developed using inductive and deductive approaches. Thematic analysis was used to examine product access, use frequency, stress and use triggers. **Results:** 59% of current users reported that their tobacco use stayed the same or increased since the pandemic, attributed to being home more with greater time/boredom. Participants noted that COVID had impacted purchasing behaviors such as buying more at one time, going online, going to a different store due to cleanliness. Health conscious participants reported using less tobacco products and not smoking in public due to the perception of smoking and COVID-19, in addition to having to take off their mask to smoke. Lack of social use of tobacco had modified the flavors used, changes in the setting of use, and shared product use. Financial impacts included increased costs for products, job loss limiting resources, and stockpiling products for lower prices and decreased access. Few participants mentioned the pandemic making them want to quit. **Conclusion:** Current tobacco users have experienced major changes in their tobacco use routines. Potential barriers and facilitators of cessation have occurred during the global pandemic.

FUNDING: Federal

PH-322

A VALIDATED METHOD FOR SIMULTANEOUS QUANTITATION OF 20 COMMON FLAVORING CHEMICALS IN E-CIGARETTE REFILL SOLUTIONS

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Significance: Limited methods exist to measure the concentration of flavoring chemicals in e-cigarette refill solutions. This study's aim was to establish a highly accurate and precise quantitative method for commonly used flavor compounds previously identified in flavored refill solutions, including pod solutions. **Methods:** Twenty flavoring chemicals were measured in the study: 2,3,5-Trimethylpyrazine, Acetoin, Benzaldehyde, Benzyl Alcohol, Butanoic Acid, DL-Limonene, Ethyl Maltol, Ethyl Salicylate, Ethyl Vanillin, Eucalyptol, Eugenol, Furaneol, Isovaniillin, L-Menthol, Maltol, Methyl Salicylate, (+) Pulegone, trans-Cinnamaldehyde, Triacetin and Vanillin. Aliquots of 30uL e-liquid solutions were mixed with 3mL of methanol and 30uL of 1mg/mL internal standard mix. Analysis was performed using a 7890B/7250A GC/Q-TOF (Agilent Technologies) on a DB-624UI column (30m x 0.25mmID x 1.4umdf). An aliquot of 1uL was injected with a 20:1 split ratio and 2.0mL/min column flow. Initial temperature was held at 60°C for 1 min then ramped 30°C/min to 225°C and held for 4 mins. Total run time was 13.5min. Initial calibration standards were prepared by spiking each compound collectively in 50:50 PG:VG (5 percent H₂O) with subsequent serial dilutions that ranged 0.02mg/mL to 10mg/mL. Method validation followed the Scientific Working Group for Forensic Toxicology (SWGTOX) Standard Practices for Method Validation in Forensic Toxicology. **Results:** Calibration and quality control samples were analyzed across 7 batches on

separate days. Correlations of determination (r^2) values were all greater than 0.990 when fitted with a quadratic $1/x^2$ model, using Internal Standard quantitation. Bias and precision within-run and between-run were within ± 20 percent. LOQs were determined from the lowest acceptable calibration level and varied from 0.02mg/mL to 0.63mg/mL. Over 250 consumer products were evaluated, demonstrating the capacity for routine analysis with this method. **Conclusion:** The large dynamic working range provided by this method allows for a variety of concentrations to be rapidly measured in consumer products, while maintaining a high level of accuracy and precision.

FUNDING: Federal

PH-323

PERCEIVED VERSUS ACTUAL HEALTH RISK KNOWLEDGE OF ENDS IN A NATIONAL SAMPLE OF YOUTH

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Significance: Although electronic nicotine delivery systems (ENDS) are the most commonly used tobacco product by youth, the health effects of such use remain unclear. Previous work has documented the relationship between ENDS use and perceptions that the products are less harmful or addictive than combustible tobacco; however, few studies have examined differences in perceived versus actual knowledge of health risks. **Methods:** From a nationwide online survey of US youth (N=2,654) that included ENDS users and nonusers ages 13-18, perceived and actual health risk knowledge were examined using chi-square tests of independence, multinomial logistic regression, and the likelihood ratio test. Results were adjusted for gender and current ENDS use status. **Results:** Of the participants, 824 (31.05%) had low self-reported perceived knowledge of ENDS health risks, 820 (30.90%) had moderate perceived knowledge, and 1,010 (38.06%) had high perceived knowledge. On a scale of actual ENDS health risk knowledge, 251 (9.46%) ranked at the lowest end of the spectrum and 948 (35.72%) ranked at the highest end, with 1,455 (54.82%) ranked in between. Odds of scoring at the highest end of the spectrum increased threefold (OR = 3.00, 95% CI = 2.08-4.34) when moderate perceived knowledge was reported and over 5 times (OR = 5.31, 95% CI = 3.73-7.57) when high perceived knowledge was reported. Females were significantly more likely to have higher actual knowledge, and current ENDS users were significantly more likely to have lower actual knowledge. **Conclusion:** These findings suggest that youth who perceived themselves to be knowledgeable about the health risks of ENDS actually did possess correct information. However, the overall knowledge of ENDS health risks was low. Thus, considering the vulnerability of youth to tobacco, and especially ENDS, use, additional health campaigns are needed to increase overall understanding of risk. Reaching male youth in such campaigns may be especially important.

FUNDING: Federal

PH-324

COMPLIANCE WITH THE SMOKE-FREE POLICY IN KARACHI, PAKISTAN

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Significance: In 2002, the Government of Pakistan passed the "Prohibition of Smoking in Enclosed Places and Protection of Non-smokers Health Ordinance", which bans smoking at all places of public work and use. Despite the growing tobacco epidemic in Pakistan, efforts to assess compliance with the smoke-free policy and minimize the harms caused by secondhand smoke exposure have been lacking in Karachi, the nation's most populated city, with a population exceeding 20 million. The objective of this study was to assess compliance with the smoke-free policy across public venues in Karachi. **Methods:** Observational data were collected by trained data collectors across the East and South districts of Karachi between October and December 2019. Observations pertaining to evidence of smoking (observed smoking, cigarette butt litter, and the display of ashtrays), the required display of no-smoking signage, and the presence of



designated smoking areas/rooms were conducted across nine different types of public venues (N=1,641) using an observation form that had been uploaded to a mobile data collection application. Descriptive data analysis was conducted to understand the level of compliance (measured by a composite indicator assessing evidence of smoking) by venue type. **Results:** Compliance varied across venues; overall only 56% of all venues were compliant. Compliance was less than half among venues commonly visited by the general public for leisure purposes including amusement centers (30%), restaurants (43%), sports facilities (43%), and hotels (44%). Compliance was also less than half at places of work, including government offices (48%) and private offices (49%). Only 6% of venues had no-smoking signage displayed at the main entrance, and 11% had signage displayed inside the venue. Designated smoking areas were present across 4% and 9% of venues in the East and South districts, respectively. **Conclusion:** There is poor compliance with the smoke-free policy in Karachi. High compliance with the smoke-free policy is important to protect people from the harms of secondhand smoke. The 100% smoke-free ordinance must be strictly enforced by district authorities.

FUNDING: Nonprofit grant funding entity

PH-325

E-LIQUID FLAVOUR CHOICES BY NEW ZEALAND ADULT SMOKERS USING AN ELECTRONIC NICOTINE DELIVERY SYSTEM: A LONGITUDINAL EXPLORATION OVER 12-20 WEEKS

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Introduction: Regulators in some countries are considering limiting the availability of e-liquid flavours in order to decrease the appeal of electronic nicotine delivery systems (ENDS) among children and non-smokers. However, little is known about how e-liquid flavour choices evolve among ENDS users. We describe patterns of e-liquid and flavour category use, and variety-seeking, among New Zealand adult smokers during an ENDS-assisted smoking quit attempt. **Methods:** Data were collected in 2018-2019, using a longitudinal design comprising up to five in-depth interviews over a 12-20 week period. Participants (n=32) were current smokers aged 19-56 years, not currently using an ENDS once a week or more often, and willing to use an ENDS to try and quit smoking. We purchased participants an ENDS starter kit of their choice; they supplied their own e-liquids in their choice of flavours. E-liquid data were extracted from the verbatim transcripts and categorised into flavour categories. We explored these data for the whole sample, and by flavour category purchased at intake (tobacco vs non-tobacco flavours), over time and at each interview. **Results:** Tobacco flavours were the most commonly purchased single category at intake (n=14), with most of these participants still using e-liquids from this category at study exit, either alone or alternating with non-tobacco flavours. However, the majority selected only non-tobacco flavour categories at intake (n=18). A minority of these participants also used tobacco flavoured e-liquids after intake, usually reporting use at only one or two interviews before reverting to sole use of non-tobacco flavours. Overall, many participants described variety-seeking behaviours, which typically occurred during the first 12 weeks of enrolment. **Conclusion:** Most participants did not follow a straightforward e-liquid or flavour category pathway. Supporting users' e-liquid and flavour variety-seeking during the first months of an ENDS-assisted quit attempt could create opportunities to couple e-liquid purchasing occasions with cessation advice offered at specialist ENDS stores.

FUNDING: Nonprofit grant funding entity

PH-326

A QUALITATIVE STUDY ON NORTH KOREAN DEFECTORS' SMOKING EXPERIENCE IN NORTH KOREA

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Significance: The World Health Organization (WHO) reported the prevalence of cigarette smoking in North Korea in 2017 as 19.2% (male 40.3% and female 0%). However, some evidence showed that the actual prevalence would be far higher. While North Korea signed the WHO FCTC in 2003, implementation of tobacco control policy in the country is unknown. This study aimed to explore North Korean defectors' smoking experience in North Korea so that we can understand their smoking patterns and policy implementation in the country. **Methods:** Interpretive description approach was used. 13 adult North Korean defectors (mean age: 41.15±13.95 years) who were living in South Korea at the point of data collection and had smoking experience in North Korea were recruited through purposive sampling and snowball sampling methods from April to August 2020.

Semi-structured in-depth interviews were conducted with the participants. All interview data were inductively analysed according to the interpretive description guideline using NVivo 12. **Results:** Three themes with 11 sub-themes were identified: 1. Normalisation of male smoking (High smoking prevalence and cigarette consumption; Smoking as a manly activity; Free distribution of cigarettes in the military; and Tacit social agreement on a ban of female smoking); 2. Cigarettes as bribes (Expensive cigarette smoking as a symbol of wealth; Cigarette as a common problem resolution tool; Hierarchical society); 3. Lack of tobacco control policy implementation (Smoke-friendly contexts; Common indoor smoking; Lack of smoking prevention education; No cigarette taxation). **Conclusion:** We provided the first findings of the smoking situation in North Korea. Male smoking prevalence presumably exceeds that of the WHO report, and WHO FCTC had not been implemented in North Korea. Moreover, smoking behaviours were highly influenced by socio-cultural norms in North Korea. Further quantitative research is required to confirm our findings.

PH-327

DIFFERENCES IN YOUNG ADULTS' PERCEPTIONS OF E-CIGARETTES BY HISTORY OF USE

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Significance: E-cigarette use has increased exponentially among young adults. However, this group is relatively understudied, and the majority of work that has been done has focused on demographics of users and predictors of use. Few studies have examined perceptions of e-cigarettes (e.g., safety, popularity) or differences between sole e-cigarette users and non-users. This lack of attention is unfortunate as sole e-cigarette use (vs. dual use) is more common among young adults. Further, the recent wave of EVALI cases and subsequent deaths, which primarily affected young adults, may have changed their risk perceptions. **Methods:** Thus, the purpose of the current study was to examine differences in perceptions of e-cigarettes among young adults (n = 338) participating in an online survey. Participants were divided into 3 groups based on e-cigarette use history: (1) Never Users (n = 178); (2) Ever Users (tried at least once but no use in past 30 days; n = 109); and (3) Current Users (use within past 30 days; n = 51). **Results:** Compared to never and ever users, current users endorsed more positive health effects from e-cigarette use [F(2,334) = 15.2, p < .01] and viewed e-cigarettes as healthier [F(2,331) = 25.9, p < .01], safer [F(2,332) = 36.7, p < .01], less dangerous [F(2,333) = 31.5, p < .01], less likely to lead people to smoke [F(2,329) = 11.1, p < .01], and a useful tool to help people quit smoking [F(2,318) = 5.2, p < .01]. Across all groups, participants said their views about e-cigarettes had not changed in the past 6 months and cited boosting social image as the main reason people used e-cigarettes. A greater percentage of current users viewed e-cigarettes as safer than combustible cigarettes, whereas those in the other groups viewed e-cigarettes and combustible cigarettes as equally risky. There were no significant group differences in number of e-cigarette related negative health effects endorsed or beliefs about social acceptability and popularity (p's > .05). **Conclusions:** These findings suggest that current e-cigarette users hold beliefs about e-cigarettes that promote continued use, which need to be addressed in intervention efforts.

FUNDING: Unfunded; Federal

PH-328

PROVISION OF FREE NICOTINE REPLACEMENT THERAPY TO PARENTAL SMOKERS IN THE PEDIATRIC EMERGENCY SETTING

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Significance: Although the administration of free Nicotine Replacement Therapy (NRT) is effective in helping smokers quit, the feasibility, acceptability and safety of this practice have not been examined in the emergency setting of the pediatric emergency department (PED) or urgent care (UC). We examined the characteristics of parental smokers who were interested and eligible for free NRT during their child's emergency visit and the uptake, usage, and associated side effects of NRT use. **Methods:** We analyzed data from 377 parental smokers who were randomized to receive cessation counseling and free NRT as part of an emergency visit-based randomized controlled trial. Parents interested in NRT were screened for medical contraindications; eligible parents were given a 6-week supply of NRT patches or lozenges during their child's emergency visit and offered another supply 6 weeks later. We conducted Wilcoxon rank-sum tests and chi-squared tests to address our main study objective. **Results:** The



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majority of parents were female (87.5%), non-Hispanic Black (52.5%), and mean (SD) age was 33.1 (8.2) years. A total of 252 (66.8%) parents were interested in receiving NRT. Compared to uninterested parents, interested parents were more likely to: be older [33.6 (8.2) vs 31.9 (8.2), years]; be non-Hispanic Black (54.0% vs 49.6%); have older children [5.5 (5.0) vs 4.2 (4.6)]; have a higher readiness to quit [7.0 (2.4) vs 5.2 (2.6)]; and have a child being evaluated in UC compared to the PED (72.4% vs 56.5%). A total of 53 (21%) interested parents had >1 NRT contraindications. At 6 weeks, 94 (79.0%) parents reported some \geq NRT usage and 50 (53.2%) requested an additional 6-week supply. There were no serious adverse events and 5 (5.3%) reported minor side effects. **Conclusions:** Parental smokers in the emergency setting are interested in receiving free NRT, the majority use it, and use is not associated with adverse side effects. The emergency visit may be an optimal time to offer NRT to parental smokers.

FUNDING: Federal

PH-329

EXPLORING YOUNG ADULTS' PSYCHO-SOCIAL EXPERIENCES OF ENDS USE: A QUALITATIVE SYSTEMATIC REVIEW

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Introduction: Few studies have explored how psycho-social constructs influence ENDS uptake and practices. We conducted a systematic review of qualitative studies exploring young adults' experiences of ENDS and smoking in relation to their identity, social practices, and experiences of stigma. **Methods:** We searched electronic databases and conference proceedings for studies published from 2007-2019 that explored young adults' (aged 18-30 years) experiences of ENDS. After removing duplicates, 280 records were screened for eligibility; 14 records had data extracted and were included in this review. We used thematic synthesis to identify key themes and overarching concepts. **Results:** We identified eight overarching concepts related to participants' identity navigations, six of these anchored three continuums: authenticity and inauthenticity; social connections and loss of social connections; control and loss of control; two were standalone concepts: stigma and pleasure. These concepts did not appear in isolation and young adults' experiences revealed that ENDS uptake required navigation of many psycho-social constructs. Experiences of stigma were central to young adults' views of both smoking and ENDS, and highlight challenges this group faces when incorporating ENDS into their social practices and identity. **Conclusions:** The synthesised concepts reflect the fluidity of identity. Young adults sought to recreate yet distance themselves from smoking, found ENDS both accepted and unaccepted, and both offering and removing control. The review suggests psycho-social factors play a key role in ENDS uptake among young adults; further study could provide additional insights into how young adults use ENDS and the psycho-social experiences that facilitate and hinder uptake.

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PH-330

EXPLORING THE INTERSECTION OF TOBACCO USE AND AMBIENT AIR POLLUTION EXPOSURE IN TOBACCO NATION

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Significance: Disparities in both tobacco use and air pollution put communities at higher risk for negative health outcomes. Populations with high smoking prevalence, such as an area of the US we termed Tobacco Nation (TN), which includes 13 states in the Midwest and South with some of the highest smoking rates and limited tobacco control policies, may be particularly vulnerable to such overlapping environmental insults. **Methods:** Census tract (CT) level modeled air pollution data for particulate matter (PM_{2.5}) and ozone (O₃) from the US Environmental Protection Agency and downscaled county-level smoking prevalence estimates (Behavioral Risk Factor Surveillance) were categorized into deciles and combined to create joint smoking-PM_{2.5} and smoking-O₃ indices. Joint index results were visualized to examine areas of higher smoking and higher air pollution exposure. Hotspot analyses and bivariate cluster analyses were used to identify trends in regional clustering for joint exposure risk. **Results:** Joint indices were constructed for 72,259 CTs in the US. Over 60% (n=10,842) of CTs in TN were in the top 20th national smoking percentile. In addition to parts of California, Idaho, and Montana, ambient PM_{2.5} was predominantly highest in Midwest and Southern states, with 31% (n=5,468) of CTs in TN in the top 20th national percentile. Conversely, ambient O₃ was highest in Southwestern and Rocky Mountain states, and parts of Mid-Atlantic and Appalachia, with 5% (n=885) of CTs in TN in the top 20th national percentile. Joint

index scores were highest in Midwest and Southern states for PM_{2.5}, and a mixture of Appalachian and Western states for O₃. Overall, 82% and 54% of the worst scoring counties (top 20% index score) in PM_{2.5} and O₃ joint smoking indices were in TN, respectively. Similar regional trends were seen with index hotspot analyses (PM_{2.5} $p < 0.022$ and O₃ $p < 0.021$) as well as in bivariate cluster analyses (PM_{2.5} $p < 0.05$ and O₃ $p < 0.05$). Clustering of high smoking and PM_{2.5} was predominant in Midwest and Southern states (e.g. TN), and O₃ to a lesser extent. **Conclusion:** High smoking rates and high ambient air pollution exposure, especially for PM_{2.5}, were generally concentrated in states with established tobacco-related disparities and more limited tobacco control policies. Due to the potential synergistic risks associated with smoking and ambient air pollution exposure, Tobacco Nation and other areas of the country with elevated air pollution may find added benefits from robust tobacco control policies, even beyond their impact on reducing tobacco use.

FUNDING: Other

PH-331

UNDERSTANDING NICOTINE USING ADVANCED ANALYTICS

Signals Analytics. Signals Analytics, New York, NY, USA.

The Nicotine & Smoking Cessation Advanced Analytics Platform connects information from various and unrelated sources, enabling the advancement and dissemination of knowledge around Nicotine, Harm Reduction and Smoking Cessation to allow greater understanding of market and social dynamics and to guide grant making, research and communication strategies. The platform leverages Natural Language Processing (NLP) engines to collect, compare and connect different data types into an integrated platform. A taxonomy, or classification method, was established to be used in the structuring of unstructured, textual data and designed to encompass all relevant parameters required to properly analyze the data ecosystem. The defining of the taxonomy was done through extensive research; top down from known parameters related to the ecosystem and bottom up through surfacing of other terms used in the data. This was implemented through NLP classification methodologies and applied on big data sets at scale. Several analytic models were developed within the platform, varying in the questions being addressed, the type of parameters offered, and the data catalogs included, to allow the ability to answer complex questions across the ecosystem. Insights can be drawn from connecting Research Papers, Patents, Clinical Trials, events, social discussions, KOL discussions across the Nicotine, Smoking Cessation and Harm Reduction ecosystem. Findings within the platform include; volumes of publications, ongoing clinical studies, perception of products and brands, scientific vs. consumer interest, events aligned with consumer discussions, and entity affiliations. Signals Analytics specializes in turning unstructured and unconnected data from various external data sources into actionable insights. The company's advanced analytics and NLP engines collect, normalize, compare and connect the different data types into an integrated platform, allowing greater understanding of market and social dynamics to support decision making.

FUNDING: Other

PH-332

A QUALITATIVE EXPLORATION OF ADULT SMOKERS' SMOKING CESSATION EXPERIENCES USING E-CIGARETTES: THE IMPORTANCE OF A "VAPING SHERPA"

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Background: Electronic cigarettes (e-cigarettes) are becoming increasingly popular particularly among smokers given their harm reduction potential in comparison with tobacco cigarettes. Preliminary quantitative evidence indicates that e-cigarettes can potentially become recognized and regulated as therapeutic products for smoking cessation. Nevertheless, the experiences of smokers opting to use e-cigarettes with the intention of reducing or quitting their tobacco cigarette use are inadequately understood. Therefore, this qualitative study undergoes a qualitative exploration of adult smokers' experiences with e-cigarettes for smoking cessation. **Methods:** Between November 2018 and February 2019, 37 adult smokers participated in a total of eight focus groups in three urban cities in Ontario, Canada. Two focus group facilitators asked participants about their smoking cessation journeys and their use of vaping devices. All focus group transcripts were transcribed verbatim by a third-party transcriber and were qualitatively analyzed. **Results:** Overall, participants seemed interested in using e-cigarettes to reduce or stop their cigarette smoking. Participants reported positive and negative



health-related experiences associated with their use of e-cigarettes. Challenges associated with e-cigarette use were also common, which impeded the smoking cessation efforts of some participants. One recurring challenge was the need for self-directed navigation of the large variety of vaping products, stressing the importance of seeking guidance from a "vaping Sherpa". **Conclusion:** Although the long-term health-related impacts of e-cigarette use are still unknown, it seems promising to consider the potential of e-cigarettes as smoking cessation aids for current adult smokers. Nevertheless, to reliably guarantee smoking cessation success using e-cigarettes, effective public health communications about when and how to use these devices for smoking cessation purposes are urgently needed. **Keywords:** adult; smoker; e-cigarettes; vaping; smoking cessation

FUNDING: State

PH-333

ASSOCIATION OF JUUL USE AND COVID BELIEFS IN YOUNG ADULTS

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Significance: Electronic cigarette use may increase exposure to COVID19. The study objective was to examine beliefs about JUUL use and COVID19 in young adult current and former JUUL users. **Methods:** An online cross-sectional survey (n=159) of young adult current and previous JUUL users (56% female, 63% White, 19% Asian, 12% Hispanic, 6% other; M age=21 years, SD=1.46) showed 59 had quit JUULing and other nicotine products, 64 had reduced JUUL use or switched to another nicotine product, and 34 reported same/increased JUUL use. Participants used a 7-point Likert scale to disagree/agree with *I have reduced the amount I share my JUUL with others because of the COVID-19 virus*, and four COVID19 beliefs. In addition to examine the beliefs by JUULer type using one-way ANOVA, a multiple linear regression was used to assess associations between COVID19 beliefs and sharing JUUL with others, controlling for race and gender. **Results** Most participants disagreed with *The propylene glycol in e-liquid can kill bacteria and viruses when I vape* (M=2.96, SD=1.39) while their beliefs varied for *I am more likely to get sick from the COVID-19 virus because of my JUUL use* (M=4.15, SD= 1.85), *If I do get sick from the COVID-19 virus my symptoms will be worse than other people my age who do not use JUUL* (M=4.64, SD=1.61), and *Using a JUUL can introduce the COVID-19 virus into my lungs* (M=3.47, SD=1.76). Across JUUL user types, only the belief that worse COVID symptoms due to JUUL use showed a significant difference. Those who had quit JUULing (M=4.96, SD=1.49) reported stronger beliefs of symptom severity than those JUULing the same/increased amount (M=4.03, SD=1.64). However, those who reduced JUUL amount/switched to other nicotine products (M=4.62, SD=1.66) were not significantly different from the other two groups. Young adults with stronger beliefs that propylene glycol in e-liquid can kill viruses were less likely to reduce sharing JUUL with others ($\beta=-.26, p<.05$). **Conclusion** Overall, perceived severity (COVID symptoms worse due to JUULing) differentiated JUULers and non-JUULers, while perceived susceptibility did not, indicating specific beliefs to target for JUUL interventions.

FUNDING: Academic Institution

PH-334

NICOTINE PRODUCTS RELATIVE RISK ASSESSMENT

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Significance Nicotine products rapidly and conveniently deliver nicotine to their user for the purpose of achieving a rewarding sensation or attenuating withdrawal symptoms caused by dependence. Traditionally, such products were based on combusting or ingesting tobacco and included combustible cigarettes, cigars, western pipes, water pipes, cigarillos and several forms of smokeless tobacco. Over the past few decades, nicotine delivery has been the subject of significant innovation with the development of next generation nicotine products, such as nicotine replacement therapies, heated tobacco devices, electronic cigarettes, and non-tobacco pouches. While the health risks of combustible cigarettes and other traditional nicotine products are well characterized, there is less clarity regarding the relative risks of all nicotine products. This study represents the first quantitative relative risk assessment of nicotine products based on systematic searches and meta-analysis of the available evidence in the scientific literature. **Methods** In this study, we present a relative risk hierarchy of 13 nicotine products, based on the best available evidence in the scientific literature. The relative risk hierarchy includes both traditional nicotine products and next generation products, which are assessed quantitatively in terms of their cancer and non-cancer risk based on the available toxin emissions, biomarker of exposure and epidemiological data in

the scientific literature. These analyses were combined on an arbitrary scale from 0 to 100 to derive a combined risk score for each nicotine product, with 0 (representing the lowest risk) to 100 (representing the highest risk). **Results** Over 4,000 publications were identified and screened, with 350 studies being carried through to the final analysis. Combustible cigarettes, smokeless tobacco, cigars and snus were the most well-characterized products in the scientific literature, whereas western pipe tobacco, cigarillos, cut tobacco and non-tobacco pouches were the least well-characterized products. The top of the hierarchy is dominated by combustible tobacco products, with smokeless and heated tobacco occupying the middle and electronic cigarettes, snus and NRT representing the lowest risk products. **Conclusion** According to the available evidence in the scientific literature, combustible cigarettes are the highest risk nicotine products, followed by other combustible tobacco products, smokeless tobacco products and finally next generation nicotine products representing the lowest risk to health.

FUNDING: Nonprofit grant funding entity

PH-335

THE ASSOCIATION BETWEEN VAPING PRODUCT USE AND CIGAR, LITTLE CIGAR OR CIGARILLO INITIATION OVER TIME AMONG YOUTH AND YOUNG ADULTS

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While many studies have suggested use of vaping products increases the risk of initiating cigarette use among young people, no studies have specifically identified an association between vaping products and CLCCs despite their paralleled increased use during the past decade. This study examines whether vaping product use is associated with CLCC initiation over time, and explores the role of flavors in the relationship. The sample is drawn from the Truth Longitudinal Cohort, a longitudinal cohort of youth and young adults recruited at ages 15-21 and surveyed every six months. The sample for this study included those who had never used CLCCs between at wave 6 (2017). Two models were examined: (1) adjusted logistic regression examined the relationship between vaping product and combustible use (by wave 7) and initiation of CLCCs (occurring between wave 6 and wave 9) and (2) multinomial logistic regression examined the relative risk of current use of a flavored CLCC. Both vaping product and other combustible tobacco use that occurred by wave 7 were associated with greater odds of initiating CLCC use by wave 9 and for current use of a flavored CLCC. The expected risk of current use flavored CLCC was higher for the younger age group (vs. an older age group). Black and Hispanic youth and young adults were associated with a greater odds of initiating CLCC and current use of flavor CLCC. This study raises additional concerns about the effects of vaping product use on non-susceptible youth. Vaping product use, especially when used in combination with other combustible tobacco products, may be a strong driver of subsequent CLCC initiation. The transition from vaping products to CLCCs demonstrated in this study is concerning, since this path may be an early indicator of eventual initiation of combustible cigarettes. This study underlines the need for greater federal oversight of tobacco products, including CLCCs and vaping products, with particular attention paid to the role of flavors in these products.

FUNDING: Unfunded

PH-336

DIFFERENCES IN FLAVORANT LEVELS AND SYNTHETIC COOLANT USE BETWEEN USA, EU, AND CANADIAN JUUL PRODUCTS

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"Juul" is the dominating US e-cigarette brand and was recently introduced to Canada, UK, France, Germany, and Italy. US/Canadian products are sold with 5%, 3%, 1.5% (Canada) nicotine content, but EU regulation limits nicotine content to 1.7%. The differential nicotine content raises the question if flavor profiles and Juul device power output differ between countries. Mint, Vanilla, and Mango e-liquids from the 6 countries were analyzed by GC/MS for their principal flavorant and nicotine content. Compositions of Juul e-liquids from the US/Canada were identical and differed from the EU e-liquids, in which principal flavorant concentrations were significantly lower, possibly reflecting user preferences. US/Canadian 'Mango' e-liquid contained the emulsifier triethyl citrate which may be necessary to keep the product homogenous, and the "cotton candy" flavor ethyl maltol, not present in EU Mango e-liquid. The nicotine content matched label informa-



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tion. In EU Juul 'Mint' e-liquids, the reduced menthol content was partially substituted with the synthetic coolant WS-3 (N-ethyl-p-menthane-3-carboxamide), which was not present in US/Canadian products. WS-3 elicits a cooling effect like menthol but lacks its distinct "minty" odor. The inhalational safety of WS-3 is unknown and any legislation targeting menthol in tobacco products should be extended to synthetic coolants as they trigger similar sensory responses.

FUNDING: Federal

PH-337

QUANTIFICATION OF FLAVORANTS AND NICOTINE IN WATERPIPE TOBACCO AND MAINSTREAM SMOKE AND COMPARISON TO E-CIGARETTE AEROSOL

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Introduction: Waterpipe use remains popular among youth with the availability of flavored shisha tobacco being one of the main drivers of waterpipe use. Although waterpipe mainstream toxicant emissions are well understood, less is known about the carryover of flavorants such as vanillin, benzaldehyde, and eugenol. In this study, flavored waterpipe tobacco was analyzed for flavorants and nicotine, and subsequent carryover to mainstream smoke. **Methods:** Flavorants vanillin, benzaldehyde, and eugenol, and nicotine were quantified in vanilla-, cherry-, and cinnamon-flavored shisha tobacco by gas chromatography/flame ionization detector and subsequently in waterpipe mainstream smoke generated by a smoking machine. The setup allowed for sampling before and after the water-filtration step. **Results:** Flavorant and nicotine content in smoke was reduced 3- to 10-fold and 1.4- to 3.1-fold, respectively, due to water filtration. Per-puff content of filtered waterpipe mainstream smoke ranged from 13 to 46 µg/puff for nicotine and from 6 to 55 µg/puff for flavorants. **Conclusions:** Although water filtration reduced flavor and nicotine content in waterpipe mainstream smoke, the detected flavorant concentrations were similar or higher to those previously reported in e-cigarette aerosol. Therefore, users could be drawn to waterpipes due to similar flavor appeal as popular e-cigarette products. Absolute nicotine content of waterpipe smoke was lower than in e-cigarette aerosol, but the differential use patterns of waterpipe (>100 puffs/session) and e-cigarette (mostly <10 puffs/session, multiple session throughout the day) probably result in higher flavorant and nicotine exposure during a waterpipe session. Strategies to reduce youth introduction and exposure to nicotine via waterpipe use may consider similar flavor restrictions as those for e-cigarettes.

FUNDING: Federal

PH-338

AGREEMENT BETWEEN SELF-REPORTS AND PHOTOS TO MEASURE E-CIGARETTE AND E-LIQUID CHARACTERISTICS

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Significance: Electronic cigarettes (e-cigs) and e-liquids have many features that may impact users' experience, use patterns, and health. Survey questions that assess these features may help evaluate links between e-cig/e-liquid features and key outcomes. We evaluated the agreement between self-reports and user-uploaded photos to inform future survey development. **Methods:** Adults aged 21 and older who use e-cigs at least five days a week (N=363) answered questions about and submitted photos of their most used e-cigs (N=233) and e-liquids (N=196). Device variables included brand, reusable vs disposable, refillable vs nonrefillable, adjustable power presence, and visual display presence. E-liquid variables included brand, flavor, nicotine concentration, nicotine salt, and container size. Percentage agreement was calculated when valid photos and self-reported responses were recorded. The number of comparisons ranged from 220 (device refillable) to 232 (device brand) for device variables, and from 93 (container size) to 161 (e-liquid brand) for e-liquid variables. **Results:** 21% of participants (n=37) responded "don't know" when asked if their e-liquid contains salts; these responses were excluded from nicotine salt calculations. Percentage agreement between self-reported and photo-coded data was highest for device reusable/disposable (99.6%), refillable/nonrefillable (96%), display presence (95%), and adjustable power presence (95%). Percentage agreement was high for e-liquid flavor (92%), device brand (88%), and nicotine salt (85%). E-liquid brand (78%), nicotine concentration (75%), and container

size (75%) had the lowest percentage agreements, though these levels of agreement are substantial. **Conclusions:** Photo submissions can present challenges, including time-intensive data extraction, poor photo quality, and potential deterrence from survey completion. While photo submissions may be appropriate in certain circumstances or for variables not assessed here, the high agreement between self-reported and photo-coded variables among our sample suggests that self-report questions may be sufficient for these variables among adults using e-cigs at least five days/week. **Funding:** This work was supported with funding from the Food and Drug Administration and the National Institute on Drug Abuse (U54DA036105). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA.

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PH-339

THE IMPACT OF THE COVID19 PANDEMIC ON THE DELIVERY OF SMOKING CESSATION SERVICES AT 36 NCI-DESIGNATED CANCER CENTERS IN THE CANCER CENTER CESSATION INITIATIVE

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Significance Providing smoking cessation services as part of cancer care contributes to improved cancer outcomes. The COVID-19 pandemic may have disrupted clinical cancer care, including cessation treatment delivery. We examined how the pandemic influenced the delivery of cessation treatment at Cancer Centers in the NCI Cancer Center Cessation Initiative (C3I) between Jan to June 2020. **Methods** Program leaders at 36 Cancer Centers completed an online questionnaire in July 2020. Items assessed the use of telephone/telehealth counseling due to COVID-19. The Center's ability to engage in 15 activities related to delivering cessation treatment was measured with 5 items ranging from "not at all" to "a great deal", recoded to: no impact (not at all) or any impact. **Results** The vast majority (94%) of Centers offered telephone/telehealth counseling during this time period, an increase from the 75% that offered telephone counseling in the previous 6-months. COVID-19 affected the ability to screen and identify tobacco users for treatment at 86% of Centers; 89% of Centers reported COVID-19 affected the ability to recruit smokers into treatment. Delivering cessation counseling was affected at 72% of Centers, while fewer Centers reported that providing pharmacotherapy (58%) and referring to external services (e.g. quitline) (50%) were affected. Maintaining staff/clinician morale was affected at 80% of Centers, and 70% reported issues with training staff/clinicians. Half of Centers reported that generating EHR-based reports for program evaluation was affected, and 75% reported that following up with program participants was affected. **Conclusion** C3I Cancer Centers shifted to providing telephone counseling during the COVID-19 pandemic as in-person counseling services were disrupted. Even providing pharmacotherapy and referrals to external cessation services were affected at least half of Centers by the pandemic. Larger impacts were reported on identifying/recruiting smokers into treatment and training clinicians which may affect program reach. Further, participant follow-up was limited which may have implications for cessation outcomes.

FUNDING: Federal

PH-340

THE EFFECTS OF POD-MOD E-CIGARETTES ON ENDS USE TRAJECTORIES FROM 2014-2019

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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. Growth in prevalence was not a steady linear increase; current use among teens increased 78% between 2017 and 2018, alongside the introduction of vape pod systems (i.e., JUUL) to the market. This study investigates trends in the growth of ENDS among youth and young adults and how the changing e-cigarette marketplace disrupted those trends. Data are from the Truth Longitudinal Cohort (TLC), a 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). For waves 2 through 6, current ENDS use included past 30-day use of e-cigarette and/or e-hookah/e-cigs/vape pens/hookah pens/vape pens; in waves 7 and 8, past 30-day JUUL use was also included. 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). Demographic controls were also included. Results found differences in odds of current ENDS use before and after the introduction of pod-mods to the market. From wave 2 to wave 4, no significant difference was found in the odds of current ENDS use vs. no current ENDS use. However, from wave 5 to wave 8, the growth estimate was significant and positive; as time increased, the odds of currently using an ENDS product was approximately 2 times the odds of not currently using an ENDS product. This study describes the growth in ENDS use since the summer of 2016 and demonstrates the disruptive influence of pod-mods on the ENDS marketplace. Future analysis will use 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: Unfunded

PH-341

ASSOCIATION OF ELECTRONIC NICOTINE PRODUCT USE WITH ERECTILE DYSFUNCTION: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY (WAVE 4)

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Significance: Smoking is independently associated with vascular disease (VD) including stroke, myocardial infarction, heart failure and erectile dysfunction (ED). Electronic Nicotine Delivery Products (ENDS) are currently being used by adults in the US because of perception that they are a form of harm reduction. We examined the relationship between self-reported ENDS use and ED. **Methods:** Data were obtained from the public use file of the Population Assessment of Tobacco and Health Survey (Wave 4). Adult males, ages 20 or older, who responded to the question assessing ED were included. ENDS use was classified as never, former, current someday or current every day use. Those who responded "sometimes" or "never" to "Ability to get and keep an erection adequate for satisfactory intercourse" were classified as having ED. Multivariate logistic regression models examined the association of ENDS use with ED among the full sample (n =13,711), as well as in a restricted sample of men aged 20-65 who did not report any prior CVD diagnosis (n =11,207). We adjusted for several covariates including sociodemographic characteristics, body mass index, diabetes, hypertension, high cholesterol, other tobacco use, mental health status, and frequency of physical exercise. **Results:** The proportion of ED was 20.7% in the full sample and 10.2% in the restricted sample. Current ENDS use was 4.8%, including 2.1% everyday users (full sample) with slightly higher prevalence among the restricted sample (5.6%, 2.5% respectively). Compared to never ENDS users, current everyday ENDS users were more likely (adjusted OR (aOR)= 2.24, 95% CI=1.50, 3.34) to report having ED in the full sample, as well as in the restricted sample (aOR= 2.41, 95% CI=1.55, 3.74). **Conclusions:** Daily ENDS use is associated with ED among adult males with or without CVD, including those who are younger than 65 years. While reverse causality cannot be excluded, ENDS users should be informed about this association.

FUNDING: Federal; State

PH-342

YOUTH, VAPING, AND ANTI-VAPING INITIATIVES

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Significance: Use of electronic nicotine delivery systems (ENDS) among youth has skyrocketed. Although the health effects are not fully understood, the nicotine content

of several ENDS products increases the likelihood of addiction. The scourge of youth vaping is further compounded by targeted marketing and the rapidly evolving landscape of new product options. Because youth often learn of these products before adults and can influence peers, youth involvement in prevention efforts is vital. This work examined youth perspectives on ENDS and youth-led actions in combating ENDS use. **Methods:** Through a number of initiatives (e.g., research projects to community engagement), we work to better understand youth perceptions as well as to engage youth in raising awareness of ENDS dangers. For example, high schoolers formed Students Against the Vaping Epidemic (SAVE). Using citizen science, the SAVE team conducted surveys to uncover what students, parents, and teachers knew about ENDS; hosted a parent information session complete with tables displaying disposable ENDS found in the school parking lot; formed a club replacing detention for students caught vaping with education; and partnered with middle schools to deepen younger students' understanding of vaping dangers. In-depth review of community engagement and research translation programming as well as analysis of qualitative data were conducted. Using the constant comparative method, analysis revealed several key themes. **Results:** Overall, youth indicated that they were well informed regarding ENDS, their friends don't understand the potential for addiction, and flavors were appealing. Several also discussed behavior surrounding hiding ENDS use (e.g., from family members, at school), and some expressed interest in learning more about scientific findings. In addition, SAVE's work foregrounds the importance of student-led solutions and engaging youth in prevention efforts as well as what a group of committed students can accomplish. **Conclusion:** Through youth engagement, better programming and connections can be built. Additional success becomes possible when adults listen to youth and let them lead.

FUNDING: Nonprofit grant funding entity

PH-343

USING TARGETED STRATEGIES THROUGH THE NEW YORK STATE SMOKERS QUITLINE (QL) TO HELP NEW YORK STATE'S (NYS) EFFORTS TO ADVANCE HEALTH SYSTEMS CESSATION INTERVENTIONS: OUTCOMES FROM THREE COMMUNICATION STRATEGIES

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Significance: NYS required the QL to conduct activities to support efforts to advance cessation interventions in healthcare systems. The QL used approaches across services, resources, and digital to complement NYS efforts. Communication modes were Coaches, text, web, and social media, targeted to tobacco users and health care professionals (HCP). **Methods:** Strategies standardize messages to influence actions, intentions, and attitudes about HCP cessation support and using health plan (HP) cessation benefits. Three approaches were: training and tools for Coaches to deliver messages during interventions; adding a text program to reinforce messages tailor by health insurance and; training and tools for Coaches to deliver messages to HCP about providing patient cessation, resources and get health site-specific data for ongoing outreach. **Results:** Between 4/1/2019 and 3/31/2020 Coaches handled 11,853 Medicaid and 12,385 non-Medicaid callers of which 11,557 and 11,853 received messages about seeking HCP support and HP cessation benefits respectively. At intake, 20,587 had spoken with a HCP while 4,873 did not speak to a HCP. At the follow up call of those not spoken with HCP at intake, 65.9% had spoken to a HCP while 62.4% reported intending to speak a HCP. And at follow up 57% contacted their HP while 64% reported intent to contact their HP about cessation benefits. Of 32,284 Medicaid and non-Medicaid there were a total of 22,519 who agreed to and received the text messages of which 22,507 received HP benefit tailored texts and texts to seek HCP cessation support. Of those who received text messages 913 opted out after receiving up to 15 messages. Responses to the texts are monitored for feedback and issues. Between 03/01/2019 and 8/11/2020 Coaches handled 182 calls from HCP of which 67 chose to have the Coach describe HCP support services, 15 chose to have the information email, 4 choose to have a callback to receive the information. Of 182 HCP, 78 agreed to sign up for the e-newsletter. **Conclusion:** QL's connect with thousands of tobacco users and utilize HCP networks and can be viable partners in broader efforts to facilitate cessation treatment in healthcare systems.

FUNDING: State



PH-345

INFORMATION SOURCE FOR JUUL USE BEFORE AND AFTER EVALI AND COVID19 IN YOUNG ADULTS

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Significance: Where young adults get information about JUUL and what information they seek from each source is important for targeting prevention and cessation interventions. **Methods:** As part of a larger study of young adult JUUL users, interview participants (n=51, 47.1% female, 72.5% white, M age =20.4 years, SD=1.6, 43.1% used daily) were asked about their source of JUUL information and type of information they looked for. Coded responses (ICR=98.6%) were analyzed for themes. A year later study participants (n=159; 56% female, 63% white, 63% current JUUL use) completed an online survey. Participants were asked about information sources followed by *Which source do you trust the most [the least] for information about vaping?* then *Why do you trust this source the most [least]?* The qualitative responses were categorized and analyzed by information source by 2 coders. **Results:** Interview participants identified friends (39%), JUUL website (20%), social media/google (27%) as their main information sources and experienced JUUL users were seen as the most credible source of JUUL information. JUULers primarily sought product information (including flavor) and social information about JUUL. Many also reported that they avoided seeking information about JUUL. The follow up survey showed a shift in information sources with health professionals (56.6%) and government agencies (14.5%) as the most trusted sources and friends who are e-cigarette users (18.2%) and social media (24.5%) as the least trusted sources. Participants considered health professionals to have the most comprehensive and unbiased health information about JUUL, however most participants did not have a primary care provider. Conversely, peers were less trusted sources due to their tendency to be easily influenced by false information about health effects. Participant mistrusted social media due to beliefs that information was often exaggerated, incorrect, and lacked legitimate sources. **Conclusion:** JUUL user information sources and trust in those sources shifted after health threats of EVALI and COVID19, suggesting public health intervention strategies may need to be modified depending on the social context.

FUNDING: Academic Institution

PH-346

CHANGES IN YOUTH ATTITUDES TOWARDS COMBUSTIBLE CIGARETTES, FLORIDA, 2016-2020

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Significance: From 2016 to 2019, the percentage of Florida youth 11 to 17 years of age who ever used cigarettes significantly decreased from 13.7% to 9.5%. However, this trend changed between 2019 and 2020, with the percentage who ever used cigarettes significantly rising from 9.5% to 10.3%. Understanding changes in attitudes towards cigarettes may provide insight into the increase. **Methods:** Pooled data from the 2016-2020 Florida Youth Tobacco Survey (FYTS) were used to examine changes in attitudes towards cigarettes over time among youth. Attitudes include beliefs that use makes young people look cool, helps people feel more comfortable at parties, relieves stress, and that users have more friends. Survey year was entered as an ordinal variable in logistic regression models controlling for grade level, race/ethnicity, ever cigarette use, ever electronic vapor product (EVP) use, and the presence of household cigarette or EVP users. Adjusted odds ratios (aORs) from 2017, 2018, 2019, and 2020 are compared with 2016. Statistically significant differences (p<.05) are presented. **Results:** Youth in 2017 had lower odds of agreeing that cigarette use helps people feel comfortable at parties (aOR=.93), but higher odds of agreeing that use makes people look cool (aOR=1.13). When comparing previous years with 2016, a pattern of significantly more favorable attitudes towards a greater number of cigarette attitude indicators emerged. Youth in 2018, 2019, and 2020 had higher odds of agreeing that users have more friends (aOR=1.15, 1.15, and 1.09, respectively) and that use makes young people look cool (aOR=1.31, 1.25, and 1.15, respectively). Youth in 2018 were also more likely to agree that use makes people feel more comfortable at parties (aOR=1.10) and youth in 2018, 2019, and 2020 were more likely to agree that use helps people relieve stress (aOR=1.25, 1.18, and 1.17, respectively). **Conclusion:** These results suggest a trend of increasingly favorable attitudes towards cigarette use in recent years, which may reflect underlying changes in social norms of cigarette acceptability. Monitoring these trends can help tobacco control programs design targeted prevention messaging.

FUNDING: State

PH-347

ADVERSE CHILDHOOD EXPERIENCES AND VAPING NICOTINE AMONG FLORIDA HIGH SCHOOL STUDENTS

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Significance: Adverse Childhood Experiences (ACEs) may increase the likelihood of engaging in health risk behaviors including substance use. Almost one-third (30%) of Florida high school students have ever vaped nicotine and 15.6% currently vape nicotine. Examining the relationship between ACEs and vaping nicotine among high school students may provide additional context into the high rate of ever and current vaping among this demographic. **Methods:** Data from the 2020 Florida Youth Substance Abuse Survey (FYSAS) were used to analyze the prevalence of ever and currently vaping nicotine among high school students and determine if rates vary between three groupings of ACEs. Statistical significance was set at p<.05. The 2020 FYSAS included fifteen ACE questions. The questions were placed into three ACE groups to analyze: abuse, neglect, and household challenges. The ACE groupings were then broken into two groups based on how many ACEs a student had experienced: 1-2 and three or more. **Results:** Among Florida high school students, 68.3% report experiencing at least one ACE. Of students reporting 1-2 abuse ACEs, 43.8% have ever vaped and 23.0% currently vape. Similarly, 39.7% of students with 1-2 neglect ACEs have ever vaped and 21.3% currently vape. Ever and current vaping in both the abuse and neglect ACE groups are significantly greater than among students who have experienced 1-2 household challenge ACEs where 29.5% have ever vaped and 14.5% currently vape. For all three ACE groups, students with 1-2 ACEs were significantly less likely to ever or currently vape compared to students with 3 or more ACEs. Students who report zero ACEs are significantly less likely to ever or currently vape compared to students with any ACEs. **Conclusion:** ACEs are associated with higher ever and current vaping rates among Florida high school students. Identifying students at risk of experiencing ACEs and tailoring vaping prevention messaging could help reduce the vaping of nicotine among Florida high school students.

FUNDING: State

PH-348

PRELIMINARY IMPACTS OF COVID-19 ON TOBACCO USE BEHAVIORS IN COLLEGE STUDENTS

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Much speculation has surrounded the impact of COVID-19 on substance use. Well known respiratory risks of tobacco use may make tobacco use behaviors particularly malleable in response to COVID-19. Additionally, COVID-19 has drastically impacted the social and environmental contexts of young adult college students, whose complex patterns of substance use may shift in response to COVID-19. This study aimed to examine the impact of COVID-19 on tobacco-use frequency (smoking/vaping days), quantity (cigarettes/cartridges per day), and cessation (any smoking or vaping) in young adult college students. We also aimed to examine the predictors of cessation, hypothesizing that generalized anxiety and moving home would increase the odds of cessation; the effects of seeking COVID-related news were explored. College students (N=312) recontacted two years after participating in a study on alcohol and marijuana co-use completed data collection. A subset of 104 (33.3%) reported past 7-day use of cigarettes (n=46) or electronic nicotine delivery systems (ENDS; n=89) either prior to campus closure (PC; n=91) or since closure (SC; n=81). Paired-sample t-tests found a significant decrease in past 7-day smoking frequency but not vaping frequency from PC to SC. However, this did not correspond to reduced quantity of either product. Of the participants who reported tobacco use PC, 23 (25.3%) reported no past 7-day use SC. Combining past 7-day use of either product into a single outcome, we fit a multivariate logistic regression model to examine predictors of cessation. Controlling for dependence symptoms, higher anxiety, moving home and staying home (versus continuing to live independently) were related to increased odds of cessation, whereas seeking COVID-related news was related to decreased odds. Characterizing COVID-related behavior change provides insights into the response of young adult college students to such crises and potentially informs national health messaging strategies.

FUNDING: Federal



PH-349

ILLEGAL WEBSITES SELLING THC AND NICOTINE VAPING PRODUCTS AMIDST THE EVALI VAPING-INDUCED LUNG INJURY EPIDEMIC

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Significance: In late 2019, the United States experienced a nationwide outbreak of vaping-associated lung injuries (EVALI). While many cases involved nicotine use, the overwhelming majority of cases resulted from illicitly obtained THC-based vaping cartridges (alone or co-used with vaped nicotine). Authorities seized hundreds of thousands of illicit THC products for offline sale; however, little is known about their sales online, which represent an understudied potential contributor to EVALI. **Objective:** Identify Internet THC Cartridge Vendors (ITCVs) readily accessible to consumers and analyze their characteristics, products, practices, and claims. **Methods:** A website content analysis was conducted of 64 ITCVs selling products for home delivery in North Carolina where THC is illegal, identified with a search strategy designed to capture what an average consumer could find in five minutes or less. 104 variables assessed ITCV website characteristics such as products, sales practices, claims, purchase and delivery methods. **Results:** In addition to THC vape cartridges, 92.2% of ITCVs sold other cannabis products and 12.5% sold nicotine vaping products. The most popular brands featured were Brass Knuckles (73.4%) and Dank Vapes (71.9%), featured heavily in offline seizures during EVALI enforcement operations. The low prices of THC vaping products indicated that they were likely selling counterfeit products, with over half offering free shipping and all shipping products via common carriers to states where THC is illegal. Vendors accepted a wide variety of non-traditional payment methods. While 75% of ITCVs made claims about the purity of their products, about half made claims about product legitimacy, and one-third about safety, no websites specifically mentioned EVALI. In recognition of the illicit nature of the sales, 70.3% promised to replace lost, stolen, or undelivered packages for free, and 82.8% noted discreetness of their product packaging. **Conclusion:** ITCVs present a troubling source of potentially adulterated and/or counterfeit THC vaping products easily accessible online for purchase and home delivery. Consumers of THC-containing vape products (and co-use with nicotine products) remain vulnerable to websites selling illicit products and presenting misinformation about the risks associated with these products. Further investigation and enforcement actions are needed to restrict access to these potentially dangerous products from illegal sources online, particularly amidst the backdrop of the COVID-19 pandemic.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

PH-350

SWITCHING AWAY FROM COMBUSTIBLE CIGARETTES ACROSS AN 12-MONTH PERIOD AMONG ADULT SMOKERS WHO PURCHASED THE JUUL SYSTEM

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OBJECTIVE: Evaluating switching away from combustible cigarettes (i.e., past 30-day abstinence from cigarette smoking) among adult smokers who use electronic nicotine delivery systems (ENDS) is a key component of assessing the population health effects of ENDS. **METHODS:** Adults (age ≥ 21 years) who purchased the JUUL system (JS; Juul Labs, Inc.) were recruited into a prospective cohort study in 2018. Past 30-day smoking (yes/no) was assessed among baseline Current Established Smokers (smoked within the past 30 days at baseline, smoked ≥ 100 cigarettes in their lifetime and currently smoke 'some days' or 'every day') via online surveys at 1-, 2-, 3-, 6-, 9- and 12-month follow-up assessments. Point prevalence of switching was calculated at each follow-up. Repeated-measure logistic regression models assessed associations of baseline sociodemographic factors and smoking characteristics and time-varying JS use characteristics with switching across the 12-month period. **RESULTS:** Among baseline Current Established Smokers (N=17,986; 55.0% male, 78.3% white, mean age=32.65 [SD=10.81], mean baseline cigarettes/day=11.10 [SD=8.16]) rates of self-reported switching increased across the follow-up period: 1-month (27.2% [n=13,650]), 2-month (36.4% [n=13,533]), 3-month (41.0% [n=13,257]), 6-month (46.6% [n=11,621]), 9-month (49.4% [n=12,186]), 12-month (51.2% [n=11,919]). In the repeated-measure model past 30-day switching averaged across the entire 12-month follow-up period was positively associated with increased past 30-day frequency and daily quantity of JS use and levels of JS dependence across the follow-up period ($p < 0.002$), and negatively associated with increased levels of combustible cigarette dependence, longer duration of regular smoking and heavier cigarette consumption at baseline ($p < 0.001$). There was a significant association of time (follow-up) and switching, such that the odds of switching increased with each successive follow-up assessment ($p < 0.001$). **CONCLUSIONS:** Among adult smokers who purchased the JS and responded to surveys

switch rates increased across the 1-year follow-up period to 51.2% at the 12-month follow-up. Frequency and quantity of JS use and greater levels of JS dependence were positively associated with switching across the follow-up period. These results suggest that greater uptake of and engagement with the JS may facilitate smokers in switching away from combustible cigarettes.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-351

EXAMINATION OF ASSOCIATION BETWEEN FLAVORS AND NICOTINE STRENGTHS OF AN ORAL TOBACCO DERIVED NICOTINE POUCH PRODUCT AND CIGARETTE SMOKING OVER SIX WEEKS OF AD LIBITUM USE

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Significance. The continuum of risk among tobacco products, with conventional combustible cigarettes at the highest end of that spectrum and noncombustible products on the lower end, is well accepted by many in public health. Oral tobacco-derived nicotine (OTDN) containing products are an emerging category that offers noncombustible alternatives to adult smokers (AS) unable or unwilling to quit. We assessed actual use behavior, under near real-world conditions, of *on!* nicotine pouches (ONP), an OTDN product that does not contain cut or ground tobacco leaf. ONP are available in five different nicotine levels and seven flavors. The objective of the current analyses was to examine the association between flavors and nicotine levels used across all weeks and reduction in smoking. **Methods.** We enrolled AS, adult dual users of cigarettes and smokeless tobacco (ST) products (DU), and adult ST product users (STPU). Following screening and a 5-day trial period (Phase 1), qualifying participants were provided open access to ONP and used other tobacco products *ad libitum* over a 6-week period (Phase 2). Participants completed daily and weekly surveys, and an end of study survey. In total, $n=399$ AS, $n=395$ DU and $n=353$ STPU completed the study. A random-intercept model was used to examine the association between the number of cigarettes per day (CPD) and the number of flavors, number of nicotine levels, and mean nicotine level used during Phase 2. **Results.** All flavors and nicotine levels of ONP were utilized during Phase 2 and, on average, participants used 4-5 different flavors. There was a statistically significant inverse association between the number of flavors used and CPD, both among AS ($b = -0.062, p < 0.001$) and DU ($b = -0.046, p = 0.010$) in the adjusted model. The number of nicotine levels and the mean nicotine level used were not associated with CPD. **Conclusions:** Under the conditions of this study, a larger number of ONP flavors was associated with fewer CPD, independent of nicotine level. Results suggest that when presented with the choice of a variety of flavors, adult smokers may smoke fewer cigarettes which may eventually lead to complete switching.

FUNDING: Tobacco Industry

PH-352

IQOS USE PREVALENCE AND HISTORY OF TOBACCO PRODUCT USE: FINDINGS FROM SURVEYS IN JAPAN, ITALY, AND GERMANY

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Significance: With the increasing availability of tobacco and/or nicotine-containing products (TNP) that do not burn tobacco but heat it, and have the potential to present less risk of harm, it is important to assess the impact of the emergence of this product category at a population level. Philip Morris Products S.A. has conducted repeated cross-sectional surveys in Japan, Italy, and Germany to monitor the use prevalence of its heated TNP (marketed under the IQOS brand name) after its commercialization. **Methods:** Surveys with probability samples of the adult general population in Japan, Italy, and Germany were used to estimate the use prevalence of IQOS and other TNPs. In parallel, for complimentary insights into a sizeable number of adult IQOS users, surveys among IQOS users with random samples drawn from country-associated IQOS Owner databases were used to estimate indicators of TNP initiation. **Results:** In most recent years, the prevalence of IQOS use in the general adult population of Japan (2017-2019: 1.8%, 3.2%, and 3.3%, respectively), Italy (2018-2019: 0.7% and 1.1%, respectively), and Germany (2018-2019: 0.2% and 0.3%, respectively) has increased. Furthermore, the surveys in the IQOS user samples revealed that, in 2019, a total of 99.3% of IQOS users in Japan, 99.5% in Italy, and 99.8% in Germany had a history of TNP use before starting to use IQOS. For Japan, where the prevalence of IQOS use is high enough for estimating indicators for TNP use initiation on a population-based level, the population estimate for history of TNP use before starting to use IQOS was 99.6%, which confirms



the estimate based on the IQOS user sample. **Conclusion:** The most recent data from Japan, Italy, and Germany show varying extents of IQOS use prevalence in the three countries. However, in all three countries, virtually all IQOS users had a history of TNP use before starting to use IQOS, indicating very low TNP use initiation with IQOS. Factors such as regulatory frameworks, harm reduction strategies, product availability and awareness, and consumer acceptance might explain the differences in IQOS use prevalence in these countries.

FUNDING: Tobacco Industry

PH-353

A RANDOMISED COMMUNITY-BASED TRIAL OF A CLOSED-SYSTEM POD E-VAPOUR PRODUCT AND NICOTINE REPLACEMENT THERAPY FOR CIGARETTE ABSTINENCE AND REDUCTION

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Significance: E-cigarettes are the most commonly used method of quitting smoking in the United Kingdom. This study assessed the effectiveness of a closed-system pod e-vapour product and nicotine replacement therapy for reducing and replacing conventional cigarettes. **Methods:** Established daily cigarette smokers aged 18 years and older were recruited in London, United Kingdom and randomised to receive a three-month free provision of either (i) over-the-counter nicotine replacement therapies (NRTs); or (ii) a closed system pod e-vapour product (*myblu*TM) containing either nicotine salt e-liquid pods (NSPs) or (iii) freebase nicotine e-liquid pods (FBNPs). Participants in each of the two e-cigarette groups were given a primary device, a backup device, and reimbursement for retail purchases of up to 12 e-liquid pods (six packs of x2 pods) per month for three months. Participants were encouraged to use their assigned e-vapour product and to choose and change flavours and nicotine concentrations of their assigned e-liquid pods as they wished. Online surveys administered at study enrolment and then at one, two, three, and six-months post-enrolment assessed self-reported past 30-day consumption of conventional cigarettes and use of NRTs and assigned e-vapour products. Participants who were lost-to-follow-up were considered to be smoking at the level indicated at study enrolment. **Results:** A total of 426 participants were randomised and completed the enrolment assessment. The six-month retention rate was 85.8% in the NRT group, 85.5% in the *myblu* plus NSPs group, and 73.6% in the *myblu* plus FBNPs group. The six-month past 30-day cigarette abstinence rate was 21.3% in the NRT group (30 of 141 participants), 30.3% in the *myblu* plus NSPs group (44 of 145 participants), and 24.3% in the *myblu* plus FBNPs group (34 of 140 participants). Among participants who were not abstinent at six-months, total past 30-day cigarette consumption at six-months was significantly lower than at study enrolment in all three groups, with the magnitude of reduction observed to be comparable across groups (NRT group, $n = 111$, $M = 174.1$ fewer cigarettes pp/pm, $SE = 19.1$; *myblu* plus NSPs group, $n = 101$, $M = 156.3$ fewer cigarettes pp/pm, $SE = 19.9$; *myblu* + FBNPs group, $n = 106$, $M = 140.3$ fewer cigarettes pp/pm, $SE = 19.4$). **Conclusions:** The *myblu* pod e-vapour product was at least as effective as nicotine replacement therapy for yielding cigarette abstinence among adult established daily smokers, and a significant reduction in cigarette consumption among those who did not achieve abstinence.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-354

EXAMINATION OF THE IMPACT OF E-LIQUID NICOTINE STRENGTH ON PERCEIVED DEPENDENCE ON MYBLU E-CIGARETTES

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Introduction: E-cigarettes are a potentially less harmful alternative to combustible cigarette smoking for adult smokers. While it has been proposed that e-cigarettes which have nicotine delivery characteristics similar to that of cigarettes are likely to be more effective in helping smokers switch from cigarette smoking, there is a concern that use of high nicotine strength e-liquids could lead to greater nicotine dependence. **Methods:** Data were obtained from 2 waves of a nationally representative cross-sectional survey assessing perceptions of the risks, benefits, addictiveness, and appeal of conventional cigarettes and *myblu* e-cigarettes among young adults (aged 18-24) and adults (aged 25+) in the United States, and also from a follow-up wave of a longitudinal survey assessment of use behaviours in purchasers of *myblu* e-cigarettes aged 21+. Data were analysed from a series of questions relating to dependence which were adapted

from the Fagerstrom Test for Cigarette Dependence and the 4-item PROMIS nicotine dependence item bank, which were asked to current (past-month) users of *myblu* e-cigarettes along with questions concerning their most often used nicotine concentration. **Results:** 338 young adults and 612 adults reported pastmonth *myblu* use. Controlling for age group, a General Linear Model revealed no difference in total PROMIS scores between users of high and low nicotine concentration *myblu* e-cigarettes ($t = -0.00$, $p = 0.998$). Furthermore, logistic regression revealed no significant difference in craving scores between nicotine concentration groups when controlling for age group ($OR = 1.17$, $p = 0.49$), while ordered logistic regression, controlling for age group, revealed no significant difference in time to first daily use of *myblu* between nicotine concentration groups ($OR = 1.21$, $p = 0.25$). **Conclusions:** The use of higher nicotine concentrations in *myblu* e-cigarettes was not associated with greater measures of dependence than the use of lower nicotine concentrations.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-355

IMPACT OF A POTENTIAL MODIFIED RISK CLAIM ON THE TOPOGRAPHY OF USE OF AN ORAL TOBACCO-DERIVED NICOTINE CONTAINING PRODUCT

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Significance: Oral tobacco-derived nicotine (OTDN) containing products are an emerging category of products that may offer noncombustible alternatives to adult smokers (AS) who are unable or unwilling to quit. VERVE[®] discs or chews (Test Products) are OTDN products containing 1.5mg tobacco-derived nicotine, available in Blue Mint and Green Mint flavors. An objective of the current study was to determine the impact of viewing an advertisement with modified risk (MR) messaging on the topography (frequency, amount, and mouth use behavior) of Test Product use when AS were provided Test Products under near real-world conditions for six weeks. **Methods:** AS not planning to quit smoking were quasi-randomly assigned to advertisements containing MR messaging (Exposure Group [EG], $n=332$) or control advertisements with no MR messaging (Control Group [CG], $n=355$). After a 2-day trial period, eligible participants were provided open access to all forms and flavors of Test Products for a 6-week period with once weekly exposure to the advertisements. Participants were permitted to use other tobacco products *ad libitum* during the study and reported daily and weekly tobacco product use. **Results:** Overall, participants exposed to the advertisement with MR messaging responded similarly to those in the CG. Both EG and CG participants used Test Products on average 6-7 days per week. Longitudinal analysis indicated no significant differences in the number of Test Products used per week between groups across the duration of the study. The average length of time in the mouth per use occasion for the EG was 10.98 minutes (95% CI 10.32, 11.63) versus 11.60 minutes (95% CI 10.96, 12.23) for the CG at Week 6. Most participants used one disc or chew per use occasion (EG 75.71% vs. CG 72.95%, Week 6). Finally, the remaining outcomes related to how the Test Products were used in the mouth, did not vary by group. Similar results were observed within form (chews vs. discs) and flavor (blue mint vs green mint). **Conclusion:** Our results indicate that, under the conditions of this study, exposure to the advertisement with MR messaging did not appear to impact the topography of Test Product use among AS.

FUNDING: Tobacco Industry

PH-356

CURIOSITY AND INTENTIONS TO USE MYBLU E-CIGARETTES AND AN EXAMINATION OF THE 'GATEWAY' THEORY. DATA FROM CROSS-SECTIONAL NATIONALLY REPRESENTATIVE SURVEYS

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Background: Cigarette smoking is a cause of many human diseases. Encouraging smokers to switch to potentially less harmful alternative nicotine products, such as e-cigarettes, may have a positive impact on both individual and population health. However, counterbalancing that population health potential is the possibility that e-cigarettes may be used by never smokers and as a gateway into combustible cigarette smoking. **Methods:** Data were obtained from 2 independent, cross-sectional, nationally representative surveys of both the prevalence and perceptions of use of *myblu* e-cigarettes. Awareness of *myblu* was a pre-requisite for responding to questions on use and curiosity/intentions in both surveys. Datasets were analyzed separately for young adults (aged 18-24) and adults (aged 25+), and data were combined from 2 waves of the surveys



separated by 6 months. **Results:** In YA, myblu ever use was 2.6 4.5 times more likely in current smokers (CS) than never smokers (NS). Adult CS were 2.1 times more likely than NS to have ever used myblu in the perceptions survey but this was not significant in the prevalence survey. Curiosity in using myblu was 1.7-1.8 times more likely in YA CS compared with NS. This likelihood was 3.4 times greater for adult CS compared to NS in the perceptions survey, while in the prevalence survey there was no difference between adult CS and NS. Intentions to use myblu were significantly greater in YA CS compared with NS in both surveys, and in adults in the prevalence survey. Finally, 89 participants (0.1% of the total survey population) reported using myblu for the first time prior to smoking cigarettes and went on to become established smokers. **Conclusions:** Data from 2 independent surveys were congruent, showing that current smokers were at least twice as likely to have ever used myblu compared with never smokers. Similarly, curiosity and intentions to use myblu were generally higher in current compared with never smokers although curiosity was similar between adult current and never smokers. Further, there was low transitioning to established smoking among never smoking myblu users. Overall, these myblu use profiles suggest its availability is appropriate for the protection of public health.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-357

A RETROSPECTIVE ANALYSIS OF CIGARETTE SMOKING AND E-CIGARETTE USE IN A CONVENIENCE SAMPLE OF ADULT USERS OF LEAP ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS)

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Background: Cigarette smoking causes many human diseases. Encouraging smokers to switch to potentially less harmful nicotine products like electronic nicotine delivery systems (ENDS) may positively impact individual and population health. However, counterbalancing the positive population health potential is the possibility that ENDS may be used by never smokers and act as a gateway into cigarette smoking. **Methods:** A cross-sectional online survey examined factors associated with Leap ENDS use in 437 current adult Leap users. Data were analyzed using chi square and ttests for categorical and continuous outcomes, respectively, to examine prior, current, and intended Leap use and cigarette smoking behavior. **Results:** Of 437 participants, only 1.9% were never-smokers. Prior to first using Leap, significantly more participants had smoked cigarettes in the past 30 days (63.0%) than those who had not (37.0%; $X^2=35.93$, $p<0.0001$). 77.8% of current smokers planned to use Leap to quit smoking compared to 22.2% who did not plan to use Leap for this purpose ($X^2=50.00$, $p<0.0001$). Among 120 former smokers, significantly greater numbers of participants planned to use Leap to avoid relapse (91.9%) than those who did not (8.1%; $X^2=191.12$, $p<0.0001$). Furthermore, among these former smokers, 60 (50.0%) reported using Leap for smoking cessation, a number greater than those reporting use of other methods. In never smokers, no participants had become established smokers after initiating Leap use, and participants who smoked cigarettes before initiating Leap use were significantly more likely to be current smokers than those who used Leap before smoking cigarettes ($X^2=7.36$, $p=0.007$). Among Leap users who had never smoked cigarettes, significantly more subjects reported little/no curiosity (80.0%) in initiating cigarette smoking compared with those reporting being somewhat/very curious (20.0%; $X^2=3.60$, $p=0.03$). **Conclusions:** Most Leap users were smokers prior to using Leap, and there was prominent reporting of using Leap to either quit smoking or prevent relapse. Never smoking Leap users reported little to no interest in smoking cigarettes and did not transition to established smoking. These data support a positive role for Leap ENDS in population health.

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

PH-358

RACIAL/ETHNIC DIFFERENCES IN SWITCHING AND DUAL USE BEHAVIOR AMONG ADULT CURRENT SMOKERS WHO USE THE JUUL SYSTEM

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OBJECTIVE: In accordance with FDA guidance that recommends examining use of electronic nicotine delivery systems (ENDS) in vulnerable populations, this secondary analysis of race/ethnicity data from a prospective study of the use of the JUUL System (JUUL Labs, Inc.) by smokers aimed to assess differences in switching and dual use among different groups. **METHODS:** Longitudinal survey data from an IRB-approved

behavioral study of US adults (age \geq 21) who purchased the JUUL System starter kit from e-commerce and retail sources in early 2018 was analyzed. The analytic sample was restricted to Baseline Current Established Smokers (CES, smoked \geq 100 lifetime CC and reported smoking some days/every day) who completed every online follow-up assessment at 1, 2, 3, 6, 9, and 12 months. Descriptive analyses of past 30-day switching (no CC smoking) and dual use (CC+JUUL System use) were stratified by race/ethnicity to assess trends over time and differences by group. **RESULTS:** Among 5,677 current smokers (73.3% Non-Hispanic White, 3.1% Non-Hispanic Black, 7.8% Non-Hispanic Asian, 7.8% Hispanic, and 4.3% Non-Hispanic Other Race), mean cigarettes smoked per day at baseline ranged from 8.1 ($SD=7.0$) in Asians to 12.2 ($SD=8.4$) in Whites. Prevalence of switching and dual use were consistent across racial/ethnic groups. At 1 month, dual use (range: 40.9%-45.1%) was more prevalent than switching (range: 26.8%-32.3%) in all racial/ethnic groups. Dual use rates declined and switching rates increased among all groups, with the majority of smokers completely switching away from CC at 12 months (White, 54.4%; Black, 56.6%; Asian, 54.6%; Hispanic, 56.0%; Other, 56.6%). No significant differences in 12-month switching rates were observed across racial/ethnic groups ($p=0.24$). Less than 7% of smokers in all subgroups reported exclusive CC smoking at 12 months. **CONCLUSIONS:** In this longitudinal cohort of smokers who purchased the JUUL System, the majority of each racial/ethnic group switched away from CC at 12-month follow-up. Patterns of switching behavior and dual use did not differ by racial/ethnic group, with increased switching and declining dual use rates observed across all groups over time.

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

PH-359

FLAVORS IN POTENTIALLY REDUCED HARM PRODUCTS THEIR ROLE IN CONTINUED USE AND SWITCHING BEHAVIORS AMONG ADULT TOBACCO CONSUMERS

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Proposed bans on flavored tobacco products are intended to help prevent youth appeal. While youth should not use tobacco products at all, youth tobacco prevention efforts should be considered in light of harm reduction for adult tobacco consumers (ATCs) and the critical role flavors can play in ATCs' transitions to lower risk products. We examined results of three actual use studies that characterized test product use, its influence on other tobacco use, and the potential role of flavor variety on behaviors. Each study involved 6-weeks *ad libitum* use of multiple varieties of: an e-vapor product (14 flavors), a chewable oral tobacco derived nicotine (OTDN) product (2 flavors), and a pouched OTDN product (7 flavors). Between 517 and 1,147 adult cigarette smokers (all studies) and/or smokeless tobacco (ST) users (OTDN pouch study) completed each study. Results showed that ATCs preferred non-tobacco flavors and used a variety of flavors. Across the studies, all available flavors had similar average ratings of "liking" within product category and were used during the home use period. Most participants used more than one flavor (>90% for e-vapor and OTDN pouch; >60% chewable OTDN). Large percentages of ATCs who switched from cigarettes to e-vapor (~95%) or OTDN pouches (~83 to ~90%) used three or more flavors. Moreover, an increase in flavor number for e-vapor products or OTDN pouches was associated with a decrease in cigarette consumption (p -values < 0.001), controlling for other factors such as nicotine and consumption level. For cigarette smokers, the observed switching rates were ~23% for chewable OTDN, ~28% for OTDN pouches and ~34% for e-vapor products. ~72% of primary ST users switched to OTDN pouches from ST. Across all studies, over 50% of participants endorsed flavor-related reasons for continued use of test products. In summary, ATCs engage with a variety of non-tobacco flavors, which facilitate usage and subsequent reduction of other tobacco use. Results of these studies build on an existing body of literature, which suggests that flavor options may facilitate switching to potentially reduced harm tobacco products.

FUNDING: Tobacco Industry

PH-360

LONGITUDINAL STUDY OF DUAL USE OF COMBUSTIBLE CIGARETTES AND THE JUUL SYSTEM IN ADULT CURRENT SMOKERS

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OBJECTIVE: This longitudinal study examined trends in JUUL System use and combustible cigarette (CC) smoking over a 12-month period among US adult (age \geq 21)



smokers who newly purchased the JUUL System to assess whether dual use facilitates transitions away from CC smoking and reductions in CC consumption. **METHODS:** Baseline Current Established Smokers (CES, smoked ≥ 100 lifetime CC and reported smoking some days/every day) who newly purchased the JUUL System (JUUL Labs, Inc.) starter kit were followed over a 12-month period beginning in 2018. At 1-, 2-, 3-, 6-, 9- and 12-month follow-up assessments, past 30-day complete switching (no CC smoking) and dual use (concurrent use of JUUL System + CC) were assessed with online surveys. Among CES who smoked ≥ 10 cigarettes per day (CPD) at baseline, substantial smoking reduction was defined as $\geq 50\%$ CPD reduction from baseline. **RESULTS:** The sample (N=5,677) was primarily white (78.5%) and male (53.1%), with a mean age of 33.0 years ($SD=10.5$), and mean CPD of 11.4 ($SD=8.3$) in the past 30 days at baseline. Dual use rates decreased across the follow-up period from 71.0% at 1 month, 59.7% at 2 months, 53.8% at 3 months, 47.0% at 6 months, 43.6% at 9 months, to 40.5% at 12 months. Switching rates increased from 28.3% at 1 month, 38.8% at 2 months, 43.7% at 3 months, 49.2% at 6 months, 51.2% at 9 months, to 54.5% at 12 months. Among CES who smoked ≥ 10 CPD at baseline, dual use decreased from 77.5% at 1 month to 45.0% at 12 months with the majority (56.2%) of those still smoking reducing CPD by $\geq 50\%$ at 12 months. **CONCLUSIONS:** Among baseline CES, the majority switched completely away from CC 12 months after purchasing the JUUL System. Prevalence of dual use declined consistently over time as complete switching increased, including among heavier smokers. From 6 months onward, a greater proportion of participants reported switching than dual use. The majority of heavier smokers who remained dual users reported substantial reductions in CC at 12 months. These data suggest that dual use may be: (1) a transitional state towards full switching; and (2) associated with substantial reductions in CC among those who continue to smoke.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-361

QUALITATIVE HEALTH AND FUNCTIONING CONCEPT ELICITATION INTERVIEWS IN JAPANESE USERS OF HEATED TOBACCO PRODUCTS

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Significance: Identify relevant concepts and perceptions of health and functioning status as expressed by Japanese smokers who switched from cigarette smoking to using IQOS and other heated tobacco products (HTP). **Methods:** Face-to-face interviews (N=35) of healthy adults of legal age for using tobacco products in Japan were conducted in Tokyo (n=19) and Osaka (n=16); the participants were enrolled based on tobacco use patterns and included 15 IQOS exclusive users, 15 dual users (IQOS and cigarette), and 5 other HTP users (Ploom/Glo). The interviews were semi-structured and used an interview guide, visual collages, and turning points/retrospective interview techniques. Qualitative analyses of translated English interview transcripts were conducted using Atlas.ti software. **Results:** The mean participant age was 40.7 years with the majority being male (male 63% vs. female 37%). The participants reported that the main driver underlying the switch to an HTP was typically internalized or externalized social pressure concerning the safety and social impact of cigarette smoking. They also described several changes related to health and functioning upon switching to an HTP. They reported improvements in physical health (e.g., respiratory symptoms, physical functioning capacity, and skin appearance) and social functioning (e.g., increased social acceptance, less social stigma, and less worry about the impact on others). The perceived impact of switching on cognitive functioning (e.g., concentration) and emotional states (e.g., coping with stress) were more variable depending on use pattern. **Conclusions:** There was perceived impacts of switching from cigarettes to HTPs on health and functioning status, including improvements in physical, social, and mental status. These rich consumer insights support the relevance of these outcomes and therefore the development of new self-reported outcome measures to assess the impacts that different tobacco and nicotine-containing products have on perceived health and functioning.

FUNDING: Tobacco Industry

PH-362

EVALUATION OF TOBACCO USERS AND NONUSERS RISK PERCEPTION OF ORAL TOBACCO-DERIVED NICOTINE POUCH PRODUCTS AS THE RESULT OF VIEWING PROMOTIONAL MATERIALS

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Significance: FDA must determine whether a new tobacco product is appropriate for the protection of public health to grant authorization for marketing the product. One of the considerations in this determination is how users and nonusers perceive the risk of the tobacco product. The objective of the current study is to evaluate adult tobacco users and nonusers' absolute and relative risk perceptions of oral tobacco-derived nicotine (OTDN) pouch products following exposure to promotional materials. **Methods:** A quota-based sample of adult smokers planning to quit (n=660), adult smokers not planning to quit (n=662), adult dual users of cigarettes and smokeless tobacco (ST) (n=663), adult ST users (n=671), adult former tobacco product users (n=666), and adult never tobacco users (n=669) participated in this online quasi-experimental survey study. Participants were assigned to either a (1) full exposure (print materials, website screen shot, health information, image of the candidate products), or (2) reduced exposure (health information, image of the candidate products) condition. Participants completed pre- and post-test surveys which included measures of general harm, specific risk, and indirect relative risk. **Results:** At post-test, 86.23%-96.23% of participants across conditions and groups rated the OTDN products as being slightly, moderately, or very harmful. Across all subgroups and conditions, participants rated the likelihood of general and specific diseases (e.g., mouth cancer, lung cancer) for a person who only uses the OTDN products daily as significantly lower than the likelihood of the same diseases for a person who smokes cigarettes daily. Participants perceived quitting all tobacco products and never using tobacco products as less risky than using the OTDN products daily. Conversely, participants perceived using cigarettes and ST products as more risky than using the OTDN products daily. **Conclusion:** After viewing promotional materials, adult tobacco product users and nonusers generally perceived the OTDN products as harmful. They viewed the OTDN products as less risky than smoking cigarettes, and riskier than cessation or never using tobacco products.

FUNDING: Tobacco Industry

PH-363

REAL-WORLD EVIDENCE OF DIFFERENCES IN LEVELS OF BIOMARKERS OF POTENTIAL HARM AMONG USERS OF A HEAT-NOT-BURN TOBACCO PRODUCT, CIGARETTE SMOKERS, AND NEVER-SMOKERS IN JAPAN: AN OBSERVATIONAL STUDY

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Significance: Cigarette smoking is associated with the risk of certain diseases, but non-combustible products may lower these risks. The potential long-term health effects of the next-generation non-combustible products (heat-not-burn tobacco products (HNBP) or electronic vapor products) have not been thoroughly studied. The present study aimed to investigate the impact of biomarkers of potential harm (BoPH) of one of HNBP (a novel vapor product: NTV), under the conditions of actual use. **Methods:** This study was an observational, cross-sectional, three-group, multi-center study. Exclusive NTV users (NTV, n = 259), conventional cigarette smokers (CC, n = 100) and never-smokers (NS, n=100) were enrolled. Biomarkers of tobacco smoke exposure (cotinine and total NNAL) and BoPH including parameters of physical pulmonary functions relevant to smoking-related diseases were examined, and subjects answered a questionnaire on cough-related symptoms (J-LCQ) and health-related quality of life (SF-36v2®). **Results:** Levels of BoPH (HDL-cholesterol, triglyceride, sICAM-1, WBC count, 11-DHTXB2, 2,3-d-TXB2, 8-epi-PGF2 α , FEV1, %FEV1 and FEF₂₅₋₇₅) were significantly (p<0.05) and favorably different in the NTV group as compared to levels in CC group. Moreover, no significant difference in the levels of some BoPH were found between NTV and NS groups. **Conclusion:** The results of the present study conducted under actual use conditions are suggestive of a reduction in risks of potential diseases associated with smoking in exclusive users of NTV as compared to CC smokers.

FUNDING: Tobacco Industry

FUNDING: Tobacco Industry

**PH-364****UNDERSTANDING THE NET POPULATION HEALTH IMPACT OF ELECTRONIC NICOTINE DELIVERY SYSTEMS WITH AGENT-BASED MODELING**

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Significance: Electronic nicotine delivery systems (ENDS) are an alternative for adult smokers to switch away from cigarettes; however, there are also risks associated with non-smokers initiating use of ENDS. Evidence regarding the long-term net population health impact of ENDS use after accounting for relevant behaviors is needed. We present an agent-based model (ABM) to evaluate the impact of ENDS use at a population level. **Methods:** The ABM tracks person-level attributes for a simulated group of individuals representing the U.S. population over time, based on transition rates between smoking and ENDS use states (e.g. initiation, switching, and cessation) and mortality attributable to accumulating years of tobacco product use. The model also incorporates births, immigration, and the impact of federal law raising the minimum legal sales age for tobacco products to 21. Data are drawn from key public data sources (U.S. Census, PATH) and longitudinal behavioral data from a sample of ENDS purchasers. The model estimates population-level tobacco use prevalence and premature deaths from 2000 - 2100. Outcomes are compared between two scenarios: a base case where cigarettes are the only tobacco product available, and a modified case, where ENDS products are introduced in 2010. Extensive sensitivity analysis examined net population impact when key input parameters were varied. **Results:** Validation demonstrates that the ABM simulates population-level trends realistically. Compared to the base case, the modified case where ENDS products are available yields 2.3 million premature deaths averted by 2100. These results were robust to a number of conservative assumptions and sensitivity analyses. Implausible assumptions would have to be made for the introduction of ENDS products to no longer demonstrate positive net population health benefit in the model. **Conclusion:** Our results suggest that the introduction of ENDS products as an alternative for adult smokers has a positive net population health benefit after accounting for potential behavioral transitions, and that these findings hold under a wide range of assumptions and input parameters.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-365**TRAVERSING COMBUSTED AND NON-COMBUSTED TOBACCO PRODUCTS: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVES 1-3 (2013-2016)**

Hui Cheng, Edward G. Largo. Altria Client Services LLC, Richmond, VA, USA.

Objectives: In this study, we aim to estimate transitions between combusted and non-combusted tobacco products among adults in the United States (US). **Methods:** The study population is US civilian adults 18 years of age or older, sampled in the longitudinal Population Assessment of Tobacco and Health study. Combusted tobacco products included cigarettes, cigars (traditional cigars, cigarillos, and filtered cigars), hookah, and pipe tobacco. Non-combusted tobacco products included e-cigarettes, smokeless tobacco, snus, and dissolvable tobacco. Current users were individuals who were using a tobacco product every day or some days at the time of assessment. **Results:** At baseline (wave 1, 2013-2014), an estimated 20% of US adults were current combusted only tobacco users, 6% were dual users of combusted and non-combusted tobacco users, and 2% were non-combusted only tobacco users. Among the two exclusive user groups, the majority (~60%) stayed within the same category at both wave 2 (2014-2015) and wave 3 (2015-2016) follow-ups, and ~10% became non-tobacco users at both follow-ups. Among dual users at baseline, only 24% remained dual users at both follow-ups, 27% became combusted only users at both follow-ups, and an additional 18% remained dual user at wave 2 and became combusted only users at wave 3; 4% became non-combusted only users at both follow-ups; 4% became non-tobacco users at both follow-ups. Never users and former users tended to stay within the same category. **Implications:** Dual use of combusted and non-combusted tobacco products is a relatively dynamic state. Dual users are more likely to become combusted only users than to become non-combusted only users.

FUNDING: Tobacco Industry

PH-366**PILOT STUDY TO ASSESS THE FEASIBILITY OF CONDUCTING UNDERAGE TOBACCO USE SURVEY**

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Background: The underage tobacco use landscape has been changing rapidly in the United States. Timely information on a range of tobacco products is essential to understand the underage tobacco use landscape, including use among young adults 18-20 years of age, given the recent federal change of minimum age to purchase tobacco products from 18 to 21. Altria Client Services, LLC developed and tested the Underage Tobacco Use Survey (UTUS) to gain insights about the feasibility of such a study. The ultimate goal is to provide ongoing surveillance of underage tobacco use to inform prevention efforts and to support regulatory engagement. **Method:** UTUS is designed to yield a nationally representative sample of household-dwelling individuals 13-20 years of age via an address-based stratified sampling strategy. Generic participation invitations were sent to sampled households via postal mail. Parental consent was obtained for all participants 13-17 years of age, and participant assent was obtained from all participants before online self-administration or phone administration of the questionnaire. Survey questions were largely adopted or adapted from national surveys, and no images of any tobacco products were included. The study was approved by a designated Institutional Review Board and executed by a third-party research organization. Data were collected between March and April, 2020. Sample weights were applied, and Taylor series approximation was used for variance estimation. **Results:** A total of 485 individuals were included in the final sample. Response levels were 6.5% and 50% at the household level and the individual level, respectively. For underage individuals 13-20 years of age, 28% (95% CI=23%, 35%) had ever used a tobacco product, and 8% (95% CI=5%, 12%) used a tobacco product in the 30 days prior to the assessment. E-cigarettes were the most commonly used tobacco product among youth and young adults. Young adults 18-20 years of age were more likely to use tobacco compared to youths 13-17 years of age. **Conclusion:** The pilot study supports the feasibility of the UTUS design. Learnings will be used to further refine future survey administrations.

FUNDING: Tobacco Industry

PH-367**UNDERSTANDING YOUTH SUSCEPTIBILITY TO TOBACCO USE: IS IT GENERAL OR SPECIFIC? FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY WAVES 3 AND 4 (2015-2018)**

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Background: Susceptibility to tobacco use predicts tobacco use onset among youth. The relationships linking susceptibility and onset are non-specific, and there are shared characteristics among youths susceptible to different tobacco products. The current study aimed to estimate the extent of overlap in susceptibilities across various tobacco products, investigate sociodemographic correlates with susceptibilities, and examine whether the relationship linking susceptibility with the onset of use is product-specific or is accounted for by a general susceptibility-onset relationship. **Method:** The study population consisted of US youth 12-17 years old who had never used a tobacco product at wave 3, sampled in the longitudinal Population Assessment of Tobacco and Health study waves 3 and 4. Tobacco product-specific susceptibility at wave 3 was assessed via questions about curiosity, likelihood to try next year, likelihood to try soon and likelihood of use if a best friend offered. The onset of use of various tobacco products was defined as first use occurring between waves 3 (2015-2016) and 4 (2016-2018). **Results:** Cigarettes and e-cigarettes were the two most common (~25%), and snus was the least common (<5%). There are large overlaps in susceptibilities across tobacco products (65% of tobacco-susceptible youth were susceptible to more than one tobacco product). Tobacco-susceptible youths were also more likely to have used cannabis or consumed alcohol in the past 30 days or to associate with tobacco-using peers. Structural equation models suggest that the susceptibility-onset relationship largely operates in a non-product-specific manner, except for e-vapor: susceptibility to e-vapor use predicted the onset of e-vapor use at follow-up (beta=0.11, 95% CI=0.05, 0.17) after accounting for the general susceptibility-to-tobacco-onset relationship; none of the other product-specific estimates were statistically significant. **Conclusion:** Youth susceptibility to tobacco use overlaps widely across different tobacco products and other risky behaviors. Public health efforts may benefit from a holistic approach to risk behavior prevention.

FUNDING: Tobacco Industry



PH-368

CORRELATES OF TRANSITIONING FROM SMOKING TO NON-COMBUSTIBLE PRODUCT USE AMONG ADULTS IN THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVES 1-4 (2013-2018)

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Significance: Understanding the correlates of transitions from cigarette smoking (CS) to non-combustible tobacco product (NC) use among adult tobacco users can inform harm reduction efforts. We aimed to find robust correlates for the transition from CS to NC use among U.S. adult smokers. **Methods:** Relevant data from PATH Wave 1 exclusive adult cigarette smokers (CS) and dual users of cigarettes and NC (DU) were analyzed with follow-up tobacco use status in Waves 2, 3 and 4. The outcome of transition to exclusive NC use at Wave 2 (initial transition) and Wave 2 through Wave 4 (sustained transition) was compared to baseline status at Wave 1 for each group (CS and DU). We assessed multiple covariates at Wave 1, including tobacco use, demographics, risk perceptions, attitudes and social beliefs, personal control, advertisement exposure, and peer tobacco use on initial and sustained transition. Logistic regression with backward selection and LASSO regression models were used for analyses. **Results:** Based on results from logistic regression, disapproval of friends and family ($p=0.001$) and years smoked cigarettes ($p<0.01$) were the most significant correlates of initial transition from CS to NC: CS who had high disapproval of friends and family (OR=2.43, 95% CI=1.44, 4.09) or shorter smoking history (OR=1.03, 95% CI=1.01, 1.04) were more likely to transition to NC at Wave 2, relative to continued exclusive smoking. Correlates for initial transition from DU to NC were cigarettes per day (CPD) ($p<0.0001$) and income ($p<0.05$): DU who smoked less CPD (OR=1.10, 95% CI=1.06, 1.14) or reported higher income (OR=2.25, 95% CI=1.01, 5.01) were more likely to transition to NC at Wave 2, relative to continued DU. For sustained transition, we observe a similar level of significance among the studied correlates based on results from LASSO regression: income and CPD for DU to NC. **Conclusions:** Cigarette smoking history and influence of friends and family are the strongest predictors of initial transition from CS to NC use. Cigarette consumption and income were identified as the strongest predictors for both initial transition and sustained transition from DU to NC use.

FUNDING: Tobacco Industry

PH-369

DUAL USE AS A DYNAMIC STATE - TRANSITIONS AND ASSOCIATED FACTORS BASED ON SECONDARY ANALYSIS OF PATH WAVE 1 TO WAVE 4

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Significance: Concurrently using two or more tobacco products has become increasingly prevalent in the U.S. Studies have suggested that dual use may be a necessary state for exclusive cigarette smokers to fully transition to non-combustible tobacco products. The duration of dual use behavior and factors associated with transitions away from smoking are less known. **Methods:** We analyzed the Population Assessment of Tobacco and Health (PATH) data to assess the dynamic of dual use behavior with cigarettes and non-combustible tobacco products over time. The analysis followed adult dual users from Wave 1 through Wave 4 to assess transitions and associated factors influencing dual users completely quitting cigarette smoking. We studied two dual user groups: (1) cigarette and e-vapor dual users and (2) cigarette and smokeless tobacco dual users. Weighted univariate logistic regression models were fitted to understand factors associated with completely quitting cigarette smoking at Wave 4, including cigarette smoking history, cigarettes per day, segment of dual users based on use frequencies, risk perception and dependence. **Results:** With tobacco product use states followed from Wave 1 to Wave 4 over five years, 13% of Wave 1 cigarette and e-vapor dual users were dual using at all four waves compared to 27% of Wave 1 cigarette and smokeless tobacco dual users. Cigarette smoking history, tobacco dependence and dual use segments were significant factors associated with completely quitting cigarette smoking among cigarette and e-vapor dual users. Among cigarette and smokeless tobacco dual users, cigarette smoking history, cigarettes per day and dual use segments were significant factors associated with completely quitting cigarette smoking. **Conclusions:** Findings suggest the dual use state is a dynamic state. Depending on the tobacco products used, factors associated with transitions away from smoking may be different.

FUNDING: Tobacco Industry

PH-370

ESTIMATING THE REDUCTION IN U.S. MORTALITY IF CIGARETTES WERE LARGELY REPLACED BY E-CIGARETTES

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Since 2014, e-cigarette use has increased while combustible tobacco use has decreased substantially, resulting in less harmful constituent exposure for nicotine users. This shift can significantly reduce tobacco-related mortality, as quantified by population modeling. We use a Population Health Impact Model which incorporates user switching behaviors and relative product risks to estimate reductions in deaths and life-years lost over 50 years from 1990 from the main tobacco-related diseases (lung cancer, IHD, COPD, and stroke). We adapt a model by Levy et al. (2018), reducing uncertainty by limiting subject age, employing partial hindcasting in the follow-up period, using relative risk estimates from meta-analyses, considering the full product history, and limiting attention to four diseases. We also include sensitivity analyses to assess individual effects of varying those parameters that Levy varied simultaneously between their Optimistic and Pessimistic Scenarios; F (effective dose of e-cigarettes vs. cigarettes), X (proportion of smokers remaining so after 10 years), and Q and I (quitting and initiation rates of e-cigarettes vs. cigarettes). **Results:** In our Optimistic Scenario, deaths were reduced by 2.89 million and life-years lost by 29.60 million. In our Pessimistic scenario, the reductions were 1.06 million and 10.97 million. Varying F most affected our estimates, varying X next most, with Q and I much less important. **Conclusions:** We confirm Levy's previous conclusions that a strategy of rapidly replacing cigarettes by e-cigarettes can substantially reduce deaths and life-years lost associated with cigarette smoking. We add insight by illustrating the relative importance of the four parameters Levy varied (F being the most influential and Q and I the least) and by presenting estimated magnitudes of effect using alternative parameter values. Our study underlines the importance of giving current cigarette users a clear message on the benefits of switching completely to e-cigarettes.

FUNDING: E-cigarette/Alternative nicotine products Industry

PH-371

EXAMINATION OF THE RELIABILITY AND PREDICTIVE VALIDITY OF STRONG'S SIXTEEN-ITEM MEASURE OF DEPENDENCE

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Significance: Strong et al. (2017) developed an adult tobacco dependence index which includes sixteen-items assessing symptoms of tobacco dependence from the Population Assessment of Tobacco and Health (PATH) study across a range of tobacco product users, including cigarette, e-cigarette, cigar, hookah, smokeless tobacco, dual users of cigarette and e-cigarette, and poly tobacco product users. The purpose of this analysis was to evaluate the reliability and predictive validity of Strong's dependence instrument. **Methods:** Reliability was evaluated based on the 2-parameter item response theory (IRT) model. Predictive validity was assessed by examining the relationship between tobacco product use frequency and usage per day with tobacco dependence scores based on PATH Wave 1 cross-sectional data. Additionally, we conducted longitudinal analyses of PATH Wave 1 to Wave 4 data to understand the association between tobacco dependence and completely quit cigarette smoking, adjusting for demographics characteristics. **Results:** Reliability coefficients were relatively high (0.82 to 0.93) for all tobacco products except for hookah (0.58). Based on PATH Wave 1 cross-sectional analysis, we found monotonic relationships between tobacco dependence and tobacco product use frequency and usage per day. Additionally, the longitudinal analysis indicated that Wave 1 participants with a higher tobacco dependence score have lower likelihood of completely quitting cigarette smoking in Wave 4 among exclusive cigarette smokers (aOR=0.54, 95% CI 0.48-0.61), dual users of cigarette and e-cigarette (aOR=0.57 95% CI 0.40-0.81). **Conclusions:** While reliability was generally high when estimating dependence across a range of tobacco products, the reliability coefficient for hookah was lower than what is typically considered acceptable. Results provide support for the tobacco dependence index's predictive validity. Overall the sixteen-item dependence index has adequate reliability and predictive validity for the major tobacco product categories.

FUNDING: Tobacco Industry



PH-372

IMPACT OF USING AN ORAL TOBACCO DERIVED NICOTINE POUCH PRODUCT ON CIGARETTE CONSUMPTION AMONG ADULT SMOKERS UNDER NEAR REAL-WORLD CONDITIONS OVER SIX WEEKS

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Significance. Oral tobacco-derived nicotine (OTDN) containing products are an emerging category of products that offer noncombustible alternatives to adult smokers (AS) who are unable or unwilling to quit. *on!* nicotine pouches (ONP) are OTDN products that do not contain tobacco leaf and are available in five different nicotine strengths and seven flavors. The objective of the current analyses was to evaluate the impact of ONP on cigarette consumption in a near real-world setting over six weeks. **Methods.** AS, adult dual users (DU) of cigarettes and smokeless tobacco (ST) products, and adult ST product users (STPU) not planning to quit cigarettes and/or ST products were enrolled. After a 5-day trial period, eligible participants were provided open access to all nicotine levels and flavors of ONP for a 6-week period. Participants were permitted to use other tobacco products *ad libitum* during the study and reported daily and weekly tobacco product use. In total, n=399 AS, n=395 DU and n=353 STPU completed the study. **Results.** At Week 6, 27.3% of AS switched to ONP (switchers). An additional 39.1% of AS reported dual use of cigarettes and ONP while reducing their cigarettes per day (CPD) by 50% or more relative to baseline ("50-99% reducers"). Conversely, 3.0% and 6.3% of AS reported dual use of ONP while maintaining or increasing CPD, respectively. The trajectory of CPD during the 6-weeks among AS "50-99% reducers" was similar to that observed among the switchers; however, baseline CPD was lower among the switchers (9.3 CPD) relative to the "50-99% reducers" (15.3 CPD). Similar findings were observed among DU. **Conclusion:** The majority of AS and DU who adopt ONP reduce consumption of cigarettes. Dual use of ONP and cigarettes might be a transitional phase to switching with some dual users transitioning quicker than others.

FUNDING: Tobacco Industry

PH-373

DEVELOPMENT AND VALIDATION OF ITEMS TO MEASURE COMPREHENSION IN THE CONTEXT OF MODIFIED RISK TOBACCO PRODUCT CLAIMS

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Significance. Currently, validity and reliability of items to assess claim comprehension within the context of modified risk tobacco product applications has not been established. The purpose of this 2-phase study was to develop and validate items to assess MRTP claim comprehension. **Methods.** During Phase 1, 3 rounds of cognitive testing with adult tobacco users and nonusers were conducted to ensure that participants understood the comprehension items. Phase 2 consisted of an electronic survey, whereby tobacco users and nonusers were quasi-randomized to 1 of 3 hypothetical advertisement conditions (2 Test conditions [reduced risk, reduced exposure] and a Control condition, which was identical to the reduced risk advertisement but without the MRTP claim). A subset of participants was re-contacted to participate in a follow-up survey 1 week later. At both timepoints, participants completed a comprehension survey while viewing the assigned advertisement. **Results.** In total, 91 participants completed Phase 1, and 7,761 and 1,734 completed the first and second survey administrations of Phase 2, respectively. Three items from Phase 1 were quantitatively evaluated in Phase 2: Targeted Comprehension (TC), Target Audience, and Behavioral Implication. Higher accuracy rates were observed among participants in the Test (e.g., 69-74% for TC) than the Control conditions (e.g., 18-28% for TC). As anticipated, participants in the Test conditions who answered the Manipulation Check correctly (i.e., identified the correct claim statement) had higher comprehension rates (e.g., 81-84% for TC) than those who did not (e.g., 43-52% for TC). About 70-81% of participants in the Test conditions provided the same response to the comprehension questions at both timepoints, providing evidence of test-retest reliability. **Conclusions.** This is the first study evaluating the psychometric properties of claim comprehension items. Findings from the current study provide psychometric support for these items to measure claim comprehension as part of MRTP submissions. Results were generally similar across Test conditions, suggesting that the comprehension items would continue to be valid when utilized in the context of similar advertisements.

FUNDING: Tobacco Industry

PH-374

ASSESSING THE POTENTIAL POPULATION HEALTH IMPACT OF A MARKET AUTHORIZATION OF AN ORAL NICOTINE POUCH PRODUCT IN THE U.S.

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on! is an oral nicotine pouch (ONP) available in seven flavors and five nicotine levels. We developed and validated an agent-based computational model (ABM) to assess the potential population impact in users and nonusers of tobacco products from market authorization of ONP in the US. The ABM incorporates poly-use behaviors to evaluate the population impact of introducing the ONP. The ABM predicts changes in tobacco use prevalence and all-cause mortality by assessing the difference between a Base Case (cigarettes and smokeless tobacco (ST) products) and a Modified Case (Base Case+ONP). Base Case transition probabilities for cigarette and ST products were estimated from both published literature and analysis of Wave 1 and Wave 2 data from the PATH Study. The excess relative risk (ERR) of ONP compared to cigarettes was conservatively estimated at 5%. Dual or poly-use of ONP with cigarettes and/or ST was assigned the maximum individual relative risk based on the tobacco products being used. The ONP specific transition probabilities (cessation, switching, dual use, poly use (use of three products) and future intentions to use ONP) were estimated from a 6-week *ad libitum* Actual Use Study (AUS), and were adjusted to reflect the US population. The AUS included 1,147 adult smokers and ST users who expressed intent to use ONP and completed a trial use period. We demonstrate that introducing the ONP in the market results in a potential net benefit to the population: an additional 0.62 and 0.30 percentage points in cigarette prevalence and ST use respectively, which amounts to the prevention of 476,000 premature deaths over an eighty-year period (2020-2100). Sensitivity analyses, assessing a lower and upper bound on the AUS estimated transition rates, resulted in an estimate of ~240,000 and 1.11 million premature deaths prevented, respectively. Limitations of model predictions should be taken into consideration when drawing inferences from these results. Our ABM model demonstrates that the introduction of ONP in the market results in a net benefit to the population as a whole, with significant reductions in smoking and ST use prevalence as well as mortality over time.

FUNDING: Tobacco Industry



POSTER SESSION 1: POLICY POSTER SESSION

P-1

ASSESSMENT OF THE TOBACCO RETAIL ENVIRONMENT BEFORE IMPLEMENTATION OF A VENDOR LICENSING POLICY IN DAKAR, SENEGAL (JUNE 2019)

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Significance: Senegal's 2014 tobacco control (TC) law requires a vendor license to sell tobacco products, though the implementing decree has not been issued. Several other TC provisions are already in effect. **Objectives:** Determine tobacco vendor density in two administrative subdivisions of Dakar, and document the tobacco retail environment and violations of TC policies at the vendor level. **Methods:** Data collectors walked all streets of Grand Dakar and Médina and at all tobacco vendors recorded geographic coordinates, vendor type, and availability of tobacco and non-tobacco products using an electronic form. In a convenience sample, additional data were collected, including: presence of tobacco advertising or promotion (TAP), product display, pictorial health warning labels (PHWLs) on packs, and required signs prohibiting smoking and sales to minors. Using Google Maps, distances between schools and retailers were calculated. **Results:** Data collectors identified 490 tobacco vendors—173 in Grand Dakar and 317 in Médina, indicating a density of 3.4 and 3.5 vendors per 1000 people respectively. Small permanent shops were the most common vendor type (80%), followed by mobile carts (18%), other street vendors (2%), and others (<1%). All vendors sold cigarettes but no other tobacco products, and 99% sold non-tobacco products. At least one tobacco vendor was located within 200 meters of each school, in violation of the law. Among the convenience sample (n=141), TC policy violations varied: 2% had packs without Senegal's PHWLs; 24% had TAP other than product display; 74% displayed tobacco products; and 98% lacked one or both required signs. **Conclusions:** Médina and Grand Dakar have a high density of tobacco retailers. Compliance with some TC policies is high, but many vendors violate key provisions such as the ban on product display and sales near schools. Dakar should effectively implement tobacco vendor licensing to reduce density and aid enforcement of TC laws.

FUNDING: Nonprofit grant funding entity

P-2

EXPOSURE TO E-CIGARETTE ADVERTISING AND ITS ASSOCIATIONS WITH CURIOSITY AND SUSCEPTIBILITY TO E-CIGARETTE USE AMONG US YOUTH IN 2019

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Significance: While a substantial proportion of US youth was exposed to e-cigarette advertising in 2014-2016, it is unclear what proportion of tobacco-naïve US youth was exposed to e-cigarette advertising since the dramatic increase of e-cigarette use due to pod-based e-cigarettes (e.g., JUUL), and how it relates to curiosity and susceptibility to e-cigarettes use among US youth. **Methods:** Data were from US middle and high school youth who never used any tobacco products and participated in the 2019 US National Youth Tobacco Survey (n=10,820). They reported how often they saw e-cigarette advertisements on the Internet, in magazine/newspapers, at retail locations, and on streaming services (e.g., Hulu) and in movies. Curiosity and susceptibility to e-cigarettes use were also assessed. Weighted multivariable regression models were used to examine associations between: [1] demographics, exposure (yes/no) and frequency of exposure (1=never to 5=always) to e-cigarette advertising through each channel and across all channels; [2] exposure to e-cigarette advertising and curiosity and susceptibility to e-cigarette, adjusting for demographics. **Results:** Overall, 86% tobacco-naïve US youth were exposed to e-cigarette advertising through one of these channels in 2019. High school and female students were more likely to be exposed and at a higher frequency to e-cigarette advertising through all channels than middle school and male students (p < 0.05). Non-Hispanic Black students were more likely to be exposed and at a higher frequency than non-Hispanic White students through streaming services/movies (p < 0.05). Exposure to e-cigarette advertising, as well as higher frequencies

of exposure, were associated with higher odds of being curious of and susceptible to e-cigarettes use (p < 0.05), especially among middle school students (middle vs. high school interaction p < 0.01). **Conclusions:** Most tobacco-naïve US youth were exposed to e-cigarette advertising. This exposure was associated with curiosity and susceptibility to e-cigarette use. Given the detrimental effect of e-cigarette use among youth, effective regulations are needed to eliminate youth exposure to e-cigarette advertising.

FUNDING: Federal

P-3

DESCRIBING A VIRTUAL CONVENIENCE STORE ENVIRONMENT USABILITY AND TOBACCO-RELATED IMPACTS

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Background: Tobacco retail outlets (TROs) are an important place for regulation, as tobacco product displays and marketing may increase urge to smoke and normalize smoking. Experiments in store environments have begun to clarify the role of marketing on tobacco use, but manipulating physical TROs is costly. Virtual retail stores (VRSs) may present an effective alternative. **Methods:** We developed a VRS for testing three experimental conditions (varying powerwall placement) compared to a control condition which lacked product branding. We hypothesized that participants would be more likely to buy cigarettes, be willing to pay more for cigarettes and e-cigarettes and have a greater post-exposure urge to vape and smoke in the experimental conditions versus control. We measured smoking and vaping urge and behavior in subjects recruited from a student pool at a large Midwestern university. We exposed participants to one of four VRS conditions and asked them to complete a post-exposure survey including intention to purchase, willingness to pay for cigarettes and e-cigarettes, urge to vape and smoke. The feasibility of the VRS was evaluated by self-report measures. **Results:** Participants (N=134) were 67% male, mainly white (60%) or Asian (26%) with a mean age of 20 years (SD=1.97). In the past 30 days, 4% were smokers, 20% e-cigarette users. A binary logistic regression suggested experimental conditions were perceived as more realistic than the control (Coef=1.15, 95% CI=.44-1.86, p=.001). Results did not suggest significant differences in terms of post-urge to vape (OR=.78, p=0.625) or smoke (OR=0.47, p=0.251), or cigarettes purchased in the VRS (OR=0.61, p=0.555). Controlling for VR experience, participants were willing to pay more for cigarettes in the experimental conditions (Coef=.32, 95% CI=.003-.63, p=.048) but across all conditions, perceived realism negatively predicted willingness to pay (Coef=-1.22, 95% CI=-2.13-.30, p=0.010). VRS spatial presence and controls worked satisfactorily. **Discussion:** Future research should explore the impact of marketing on consumer tobacco-purchasing behaviors. Results suggest the feasibility of VRSs to study these effects.

FUNDING: Academic Institution

P-4

TOBACCO MARKETING EXPOSURE AND RISK FOR FUTURE TOBACCO USE AMONG YOUNG ADULT NON-TOBACCO USERS

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Purpose: Tobacco marketing exposure (TME) to advertising in retail settings and frequency of store visiting may increase risk of later tobacco use among young adults. **Objective vs. subjective measures of TME may provide differing views of risk of TME on tobacco use. Methods:** Data were collected from a study of non-tobacco using young adults (18-24) in Washington, DC, 2017-19 (n = 152). TME was measured by: (1) subjective baseline self-reported frequency of visiting stores that typically contain tobacco marketing (convenience, liquor, small markets), (2) objective real-time visits to tobacco retailers over a two week period, (3) subjective reports of seeing tobacco ads in the past two-weeks, and (4) objective amount of tobacco ads identified through comprehensive photographic store audits in stores visited by respondents over a two week period. Subjective and objective store visit frequency and advertising exposure were examined in bivariate correlations and multivariable logistic regression of past 30 day tobacco use at 6-month follow-up controlling for gender and race/ethnicity. **Results:** Measures of TME were moderately correlated (α=0.58). Bivariate analyses showed that both subjective frequency of store visits at least weekly vs. less frequently (OR=5.7



95%CI 1.8-18.0) and objective visiting measures over a two week period (OR=2.8 95% CI 1.1-6.9) were associated with tobacco use at 6-month follow-up. Subjective reports of seeing any ads vs. not seeing ads (OR=1.4 95% CI 0.5-3.5) and objective measures of visiting stores with at least 10 tobacco ads vs. fewer or no ads over a two week period were not associated with use (OR=1.7 95% CI 0.7-4.2). In adjusted models with all TME measures controlling for gender and race, only subjective weekly store visiting was associated with later tobacco use (aOR=6.0 95% CI 1.6-22.9). **Conclusions:** Young adult non-tobacco users remain at risk for both TME and future tobacco use. In this study, store visiting frequency especially measured subjectively was most strongly associated with later tobacco use. Policies reducing TME at the point-of-sale can reduce risk for even frequent store visitors.

FUNDING: Federal

P-5

PACK CHARACTERISTICS OF TOP-SELLING CIGARILLOS IN THE UNITED STATES: DIFFERENCES BETWEEN BLUNT AND NON-BLUNT PRODUCTS

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SIGNIFICANCE: Mass-merchandise cigarillos in the United States (US) are generally used for 2 purposes: as smoked tobacco products and as “blunts” (i.e., hollowed-out cigars filled with cannabis). Prior research indicates that cigarillo packaging is an appealing product feature, particularly among young adult blunt users, but few studies have characterized ways in which the industry may use cigarillo packaging as a marketing tool. **METHODS:** The 50 cigarillo products with the highest national unit sales in 2018 were identified using Nielsen sales data; 44 were successfully purchased from local retailers in July 2019. Packaging was coded for features such as: unit count (i.e., number of cigarillos), material, descriptive text, and promotions. We coded products as blunt or non-blunt based on a combination of brand and product features identified in the research literature as being associated with blunt use. Descriptive analyses, weighted by total unit sales, documented the market share of popular pack characteristics between blunt and non-blunt products in the sample. **RESULTS:** Popular brands included Black & Mild (55%), Swisher Sweets (33%), and Garcia y Vega’s “Game” (12%). Blunt products constituted 55% of the market share. While blunts were almost exclusively sold in 2-pack, resealable foil pouches (96%), non-blunts were primarily sold as single sticks (91%). Blunts were more likely than non-blunts to display the phrases “slow burn” (70 vs. 20%) and “natural” (37 vs. 7%), feature pre-pricing language (85 vs. 66%) or promotional deals (11 vs. 0%), and display social media account information on the packaging (44 vs. 0%). Blunts were less likely to contain text about age restrictions (4 vs 81%). **CONCLUSION:** A relative lack of federal regulations on cigars compared to cigarettes has resulted in a diverse and virtually unrestricted cigarillo marketplace. Packaging features such as innovative materials, sensory descriptors, and cost-saving promotions are substantially more prevalent among cigarillos commonly used as blunts, and may particularly appeal to younger consumers. Stronger packaging-focused policies at the federal and local levels may help curb cigarillo use.

FUNDING: Federal

P-6

COMPLIANCE OF A TOBACCO-FREE POLICY AT AN ACADEMIC HEALTH INSTITUTION WITH NRT AS A GOODWILL OFFERING

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SIGNIFICANCE: Health care systems rely on tobacco-free policy implementation and promotion as a part of their tobacco control efforts. Despite signage and strategic communications of policy, continued use of tobacco on premises remains problematic. Approaches by formal enforcement are a potential strategy to improve compliance. Ambassador programs, consisting of trained staff who approach policy violators, inform about tobacco-free policies, and request compliance, are proving effective on college campuses. Minimal published literature exists regarding use of ambassador programs on health care campuses. This study examines ambassador encounters with policy violators on an academic health care campus and assesses the efficacy of NRT as a goodwill offering to improve policy compliance. **METHODS:** Data from ambassador encounters with individual or group policy violators (n=180) was collected from June, 2018 to April, 2019. People using tobacco were asked to comply with the policy and either offered NRT (n=118) or not (n=62). Approaches were recorded as compliant, noncompliant, or mixed (some, but not all, complied). **RESULTS:** Violators were categorized as visitors (74%),

patients (46%), contractors (3%) or staff (4%). Products used by violators included: cigarettes (94%), e-cigarettes (3%) or other tobacco products (2%). Violators offered NRT were more likely to comply with the institution’s tobacco-free policy compared to those not offered NRT ($X^2=7.17, p<.03$). When NRT was offered, it was accepted 46% of the time. Of the NRT accepted, the majority requested lozenges (48%), gum (22%), or a mix of both (29%). Violators who accepted NRT were more likely to comply than those who refused ($X^2=7.95, p<.02$). Additionally, approaches to individuals, compared to groups, led to more compliance ($X^2=11.84, p=.002$). **CONCLUSION:** An ambassador approach to policy violators led to increased compliance with a tobacco-free policy. A goodwill offering of NRT achieved significantly greater compliance. This enforcement may increase perceived organizational support by patrons and future research should examine whether the goodwill offering of NRT improves perceptions of health systems.

FUNDING: Academic Institution; Nonprofit grant funding entity

P-7

CHANGES IN SECONDHAND SMOKE EXPOSURE AT HOME AMONG CHILDREN: FINDINGS FROM THE GLOBAL ADULT TOBACCO SURVEY

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Significance: Secondhand smoke (SHS) exposure can cause ear infections, more frequent and severe asthma attacks, respiratory infections, among children, and sudden infant death syndrome among infants. Homes are a predominant site of SHS exposure, where children are particularly vulnerable to SHS exposure because they lack control of their environment. Global Adult Tobacco Survey (GATS) data from 20 countries found at least 500 million children worldwide were exposed to SHS at home during 2009-2013. **Methods:** We analyzed data for 12 countries with repeated rounds of GATS (2008-2018): Bangladesh, China, India, Mexico, Philippines, Romania, Russian Federation, Thailand, Turkey, Ukraine, Uruguay, and Viet Nam. All countries analyzed had two rounds of data available during this period, except for Turkey which had three rounds, where the third round was compared to the second round. We assessed SHS exposure (defined as “daily,” “weekly,” or “monthly”) at home among children <15 years, as reported by the adult GATS respondent in the household. The proportion of children exposed to SHS at home was calculated for each round, which was applied to 2019 United Nations population projections for the corresponding survey year to estimate the number of children exposed. Relative change between rounds was calculated. Statistical significance was assessed using t-tests. **Results:** Nearly 119 million fewer children in the 12 countries analyzed were exposed to SHS at home between survey rounds (311 million and 430 million children, respectively). The proportion of children exposed to SHS at home decreased in 11 of the 12 countries ($p<0.05$); Thailand had a significant increase in SHS exposure (2009: 35.8%, 2011: 40.9%, $p<0.05$). The relative change in SHS exposure at home ranged from -49.5% in Ukraine (2010 and 2017) to +14.2% in Thailand (2009 and 2011). **Conclusion:** Progress was made in reducing SHS exposure at home among children in 11 countries during 2008-2018. However, over 311 million children were exposed to SHS across the 12 countries. Encouraging voluntary smoke-free home rules and providing cessation resources to adults who smoke can reduce SHS exposure among children at home.

P-8

“I THINK THAT THAT’S WHY THESE ATTRACT YOUNG PEOPLE MORE, BECAUSE OF THE FLAVORS AND THE COLORS”: PERCEPTIONS OF CIGARETTE PACKS AMONG MEXICAN CITY YOUTH

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Background In Mexico City, cigarette packs are prominently displayed at the point-of-sale, especially at the cashier zone. With a pictorial warning label that covers only 30% of the front of the pack, tobacco companies have ample space for branding on the pack. Given their importance as a marketing platform, this study aimed to explore specific features of packs that youth perceive as appealing. **Methods** Fifteen focus groups (FGs) were conducted in Mexico City with adolescents (ages 13-17) and young adult smokers (ages 18-24). FGs were separated by gender, socioeconomic status (SES) and, in the case of adolescents, smoking status. Participants interacted with a sample of cigarette packs bought locally by the study team. FGs were video-recorded, transcribed in Spanish, translated into English, and thematically analyzed. Data were then compared and contrasted within and across FGs. **Results** All FGs discussed how



cigarette packs with bold and contrasting colors are particularly appealing to youth, including themselves. Participants discussed liking seeing their favorite color on the pack. Pack colors associated cigarettes with other things, including candy and sports: "[the 49ers] have these colors, so if I'm a fan of the team I'd buy things in that team's colors [like the pack]" (male adolescent non-smoker, low-SES). Colors also communicated the addition of flavors to cigarettes, increasing pack appeal: "I think that that's why these attract young people more, because of the flavors and the colors" (male adolescent smoker, mid/high-SES). Smokers discussed how flavors and flavor capsules changed their smoking experience and how the availability of different flavors increased their curiosity: "I don't know why the capsule appeals to me, I feel I want to know what it tastes like" (female adolescent smoker, low-SES). **Conclusion** Cigarette packs with flavors and colorful designs appeal to youth, including non-smokers. Communicating flavors, especially through flavor capsules, helps keep current smokers engaged with smoking. These findings reinforce the need for stronger tobacco control policies around plain packaging and a flavor ban, to reduce pack appeal to young people. **Funding** This work was supported with funding from Bloomberg Philanthropies' Bloomberg Initiative to Reduce Tobacco Use (bloomberg.org)

FUNDING: Nonprofit grant funding entity

P-9

MENTHOL SMOKERS WHO IDENTIFY PHARMCOLOGICAL REASONS FOR USING MENTHOL MORE LIKELY TO QUIT AND USE CONTRABAND AFTER A MENTHOL BAN

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Significance: On January 1st, 2017, the province of Ontario, Canada banned the use of menthol-flavoured tobacco products. The aim of this study is to assess how reasons for use of menthol and perceptions of menthol cigarettes prior to the ban influenced quitting behaviour following the ban. **Methods:** In Ontario, menthol smokers (n=542) were assessed with baseline surveys in September-December 2016 and follow-up surveys in January-August 2019. Two latent class analyses were performed based on nine reasons for using menthol cigarettes and seven questions related to perceptions of menthol cigarettes. Smoking behaviour following the menthol ban was measured by having made a quit attempt since the ban, successful quitting (abstinence >6 months), contraband use and the number of quit attempts made. Poisson regression, with adjustment for demographic and smoking characteristics, was used to assess the probability of various quitting behaviours by perception and reasons latent class membership. **Results:** For the reasons of use analysis, an "Standard Class" (70%) (largest group endorsing all options), "Pharmacological Class" (9%) (endorsed predominant options associated with pharmacology of nicotine) and "Non-Pharmacological Class" (21%) (did not endorse options associated with pharmacology) were created. After adjustment, the Pharmacological Class and Non-Pharmacological Class had higher rates of contraband use following the menthol ban than the Standard Class (RR = 3.41, 95% CI 2.39 - 4.88; RR = 2.27, 95% CI 1.59 - 3.24 respectively), and the Pharmacological Class exhibited higher number of quit attempts compared to the Standard Class (RR = 5.90, 95% CI 1.62 - 21.44). For the perceptions analysis, an "Standard Class" (81%), "Pharmacological Class" (12%) and "Cooling Class" (7%) (endorsed only cooling aspects of menthol) were identified. After adjustment, the Pharmacological Class and Cooling Class had higher rates of contraband use following the menthol ban than the Standard Class (RR = 2.08, 95% CI 1.47 - 2.94; RR = 2.02, 95% CI 1.34 - 3.05 respectively) and the Pharmacological Class had higher rates of successful quits compared to the Standard Class (RR = 1.71, 95% CI 1.06 - 2.78). **Conclusions:** The study identified three distinct classes related to reasons for use and perceptions related to menthol cigarettes. This suggests important heterogeneity among menthol users and expected reaction to menthol bans.

FUNDING: Federal

P-10

A QUALITATIVE ASSESSMENT OF ADMINISTRATOR AND RESIDENT PERCEPTIONS OF HUD'S SMOKEFREE RULE IN THE D.C. HOUSING AUTHORITY - ONE YEAR POST-IMPLEMENTATION

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Background: The District of Columbia Housing Authority (DCHA) enacted the smokefree public housing rule required by the US Department of Housing and Urban Development (HUD) in July 2018. The rule prohibits lit tobacco products in all living units, common areas, administrative buildings, and outdoor areas up to 25 feet. This study assessed administrator and resident perceptions of the HUD smoke-free rule 1-year post-implementation. **Methods:** Data were collected via focus groups (n=9) and in-depth interviews with residents (n=19) and DCHA administrators (n=4) from August to October 2019. Focus groups and interviews were led by semi-structured guides based on the multi-level socioecological framework and were recorded and transcribed. Transcripts were independently coded by three researchers using grounded theory and analyzed by role and smoking status using Dedoose. Consensus meetings resolved discrepancies and determined themes. Inter-rater reliability was set at > 80%. **Results:** The majority of participants identified as Black/African American (90%). Themes for each socioecological level included: 1) *Individual*. Administrators and residents supported rule implementation due to perceived health benefits. 2) *Interpersonal*. Rule was effectively communicated by lease agreement, but violations were not enforced. Fears of eviction were reported. 3) *Organizational*. Signage was present, but more accessible cessation support was needed. 4) *Community*. Residents reported continuing to smell cigarette smoke and also noted the smell of cannabis, which is legal for consumption in DC, but not in federally subsidized housing. Smokers expressed safety concerns with smoking off-property. 5) *Public Policy*. Residents reported confusion on 25 feet element and a lack of rule enforcement. **Conclusions:** Administrators and residents perceive value in the smoke-free rule, but noted several challenges across each level of the socioecological framework to address in achieving a smoke-free housing environment.

P-11

THE IMPACT OF TOBACCO RETAIL LICENSING IN VIRGINIA: A SYSTEM DYNAMICS SIMULATION STUDY

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Background: Virginia raised the minimum legal age of sale for tobacco from 18 to 21 (T21), on July 1, 2019. Enforcement of the T21 law is essential to ensure the compliance of retailers and to achieve the intended effects of the law. Tobacco retailer licensing (TRL) is a possible policy tool for the enforcement. **Objectives:** To simulate and predict the effects of different levels of TRL enforcement on youth cigarette use and the consequent health and economic impacts. **Methods:** A system dynamics model (SDM) was developed. The model was parameterized, calibrated and validated based on empirical data: National Youth Risk Behavior Surveillance System (YRBSS), Behavioral Risk-Factor Surveillance System (BRFSS) of Virginia, and YRBS Combined Datasets of Virginia. **Results:** On the basis of existing practices in other states, we used 4 TRL provisions: 1) retailers are required to pay an annual fee; 2) all retailers are required to obtain a license to sell tobacco and renew it annually; 3) any violation of tobacco law is considered a violation of the license; and 4) financial deterrents using fines and penalties for violations, and suspension and revocation of the license. Our SDM simulated youth smoking status with 4 enforcement levels: No licensing; Minimum TRL enforcement (provision 1 + one of the other provisions); Moderate TRL enforcement (provision 1 + two of the other provisions); Comprehensive TRL enforcement (all four provisions). The results suggested that the Virginia youth smoking prevalence would decrease by 1.09% by the end of 2031 under comprehensive TRL enforcement compared with no enforcement. Additionally, non-Hispanic White and Hispanic youth were more responsive than non-Hispanic Blacks to the enforcement—the greatest yearly reduction in smoking prevalence was estimated to be 1.81% and 1.45%, respectively, under comprehensive TRL regulation. Our back-of-envelope estimation showed that, by comprehensive TRL regulation, \$2,459 million direct life-long medical costs and 614 smoking-attributable deaths would be saved over next 10 years. **Conclusions:** TRL regulations could be an effective policy option to ensure and enhance the effects of the T21 law.

FUNDING: Nonprofit grant funding entity



P-12

OBJECTIVE AND PERCEIVED MEASURES OF TOBACCO MARKETING ARE UNIQUELY ASSOCIATED WITH CIGAR USE

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Little is known about how tobacco marketing is associated with youth non-cigarette tobacco use. We investigated whether daily exposure to outdoor marketing within activity spaces and perceived exposure to tobacco marketing were associated with cigar use. We used Geographic Ecological Momentary Assessment data from youth aged 16-20 years (n=86 participants, n=962 observations) in 8 mid-sized California cities. Participants completed an initial survey, daily surveys, and carried GPS-enabled phones for 14 days. Tobacco outlets in study cities were visited by observers to record outlet GPS point locations and data concerning tobacco marketing. GPS locations were geocoded and activity spaces were constructed by joining sequential points. Our objective measure of tobacco marketing was defined as the number of outlets with outdoor tobacco marketing within 50m of these polylines. Daily surveys asked about tobacco use and whether participants saw tobacco ads in or by their (1) neighborhood, (2) school, (3) workplace, and (4) anywhere else each day. These items created a continuous measure of daily perceived exposure to tobacco marketing. We considered cigar use including or excluding blunt use. We used multilevel mixed effects models to control for clustering of observations within participants over time. Controlling for demographics, we found that increasing exposure to tobacco outlets with outdoor marketing was associated with higher odds of cigar use each day, excluding blunt use (aOR: 1.41; 95% CI: 1.05, 1.89). Also, increasing perceived exposure to tobacco marketing was associated with higher odds of cigar use each day, excluding blunt use (aOR: 2.16; 95% CI: 1.10, 4.23). For cigar use including blunt use, we did not find a significant relationship with exposure to tobacco outlets with outdoor marketing (p=0.11), but we did find that increasing perceived exposure to tobacco marketing was associated with higher odds of use (aOR: 1.89; 95% CI: 1.28, 2.79). Results suggest that both objective and perceived measures of tobacco marketing are associated with cigar use. Perceptions of blunt as a cannabis but not tobacco product may explain the different results.

FUNDING: Federal; State

P-13

“THEY PROMOTE THEM EVERYWHERE IN THE NEIGHBORHOOD:” A QUALITATIVE INVESTIGATION OF THE COMMUNITY-LEVEL RISK FACTORS OF CIGAR SMOKING AMONG BLACK YOUNG ADULTS

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INTRODUCTION Black young adults have one of the highest cigar smoking prevalence among all population groups. Reducing their cigar smoking requires actionable public policies at community levels. This study aims to elucidate the community-level risk factors of cigar smoking to inform such actions. **METHODS** Between May and June 2020, we conducted 40 in-depth phone interviews to explore the community-level risk factors for smoking cigars (large cigars, cigarillos, filtered cigars) and blunts among Black young adult cigar smokers ages 21-29. Interviews were audio-recorded, transcribed and coded by three coders. We used a thematic analysis to assess emerging themes and subthemes related to cigar use. **RESULTS** Several major themes of community-level risk factors emerged from the interviews. The widespread sales of cigar products at community retailers (e.g., gas stations and corner stores) facilitate easy purchasing of cigar products, especially cigarillos. Cigar marketing materials are ubiquitous in community retailers and facilities and often promote cigar brands, new flavors, and discounted prices and coupons. Smoking cigars and blunts is a community norm and considered as part of the neighborhood culture. Specific cigar flavors (e.g., fruits and wine) and brands (e.g., Backwoods and Black & Mild) are highly preferred and commonly used by community members. Seeing cigar litter (e.g., tips and wraps) and other people smoking tobacco and smelling burning cigars and marijuana trigger cigar smoking. Experiencing collective stress from the community as a whole also prompts cigar smoking episodes. **DISCUSSION** Community-level risk factors, especially targeted cigar marketing strategies (e.g., widespread sales, ubiquitous marketing, and low pricing), put Black young adults at great risks of cigar and blunt smoking. Such strategies could shape other risk factors over time, including community acceptability of smoking flavored cigars and

blunts. Local policy efforts such as price promotion bans, minimum prices, and flavored product sales restrictions may help counteract the cigar marketing strategies targeting Black communities to reduce cigar-related health disparities.

FUNDING: Unfunded

P-14

FLAVOR PERCEPTIONS OF CIGARILLO AND E-CIGARETTE PRODUCTS: A QUALITATIVE EVALUATION

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Significance: Current research on flavored tobacco products focuses heavily on e-cigarette products. Flavor plays a role in appeal of other tobacco products, particularly cigarillos. The purpose of this research was to examine parallels and differences in these flavored product perceptions. **Methods:** A convenience sample of young adults ages 21-28 (n=29) were recruited online between May-August 2020 to participate in semi-structured interviews about cigarillo and e-cigarette perceptions and use. Samples were drawn from never users (n=7) and current users of cigarillos and/or e-cigarettes (n=22). Audio-recorded interviews were 60-90 minutes long. Verbatim transcripts and field notes were coded by a trained researcher using a codebook developed using inductive and deductive approaches. Thematic analysis was used to examine perceptions of flavors with regard to cigarillo and e-cigarette products. **Results:** Cigarillo product flavors were perceived as more natural and intended to mask the flavor of the tobacco itself while e-cigarette flavors were perceived as stronger and more artificial with flavors that were more representative of the actual flavor. Participants indicated that product taste, smell, and packaging would give them an indication of a product's flavor; cigarillo labels were noted as less important in identifying flavor attributes than e-cigarette labels. Across products, fruit and mint flavors were seen as having the fewest additives and least harmful compared to other flavors. Mint and menthol flavors were described with similar adjectives with the distinction being that menthol is perceived as an extract of mint. Among those who currently used cigarillos and/or e-cigarettes, flavor was commonly listed as an important component in product selection. **Conclusions:** Perceptions of flavor are associated with risk perceptions of tobacco products. Flavored tobacco policy must take into account these varying perspectives, particularly when making regulatory decisions regarding flavored tobacco product availability.

FUNDING: Federal

P-15

PERCEPTIONS OF CIGAR HARM AND ADDICTION AMONG YOUNG ADULTS

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Background: The use of cigars, including little cigars and cigarillos (LCCs) and large cigars continues to harm young adults in the US. Although misperceptions about the risks of tobacco products influence use, research on perceptions for cigars is sparse. The goal of this study was to examine perceptions of cigar harm and addiction and to examine associations with cigar use. **Methods:** Data are from a cohort study of young adults recruited in fall 2010 from 11 colleges in the Southeast; data presented here are from the spring 2019 online survey. Participants were asked three questions about perceptions of harm and addiction of LCCs and large cigars on 5 point scales ranging from 1=strongly disagree to 5=strongly agree. We measured use of LCCs and large cigars. Those reporting lifetime use of LCCs or large cigars were asked how frequently they inhale the smoke into their lungs on a 5 point scale ranging from 1=never to 5=always. Data were analyzed using cumulative logit models. **Results:** Participants (N=1910) were 51.9% female, 84.5% White, 6.5% Hispanic, with a mean age of 26.7 (SD=0.6). Half (52.6%) reported lifetime use of large cigars and 51.5% reported lifetime use of LCCs. Those reporting lifetime use of LCCs were more likely to report LCCs as being less harmful and addictive compared to those who have never used LCCs (ORs=1.4-1.7, p<.05). Similarly, those who were lifetime user of LCCs or large cigars, compared to never users of those products, were more likely to report lower perceptions of harm and addiction, ORs=1.5-1.6, ps <.001. Half (53.7%) of large cigar users and 29.4% of LCC users reported inhaling the smoke into their lungs. Few (4.9%) large cigar users and 14.5% of LCC users reported inhaling the smoke into their lungs “often” or “always”. **Conclusions:** Perceptions of harm and addiction were lower among lifetime of large cigars and LCCs compared to never users of these products. Additional work



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is needed to better understand influences of perceptions of cigar harm and addiction, including product characteristics, such as flavors, and marketing. Public education is also needed to educate consumers about the harms of cigar products to reduce use.

FUNDING: Federal

P-16

CHARACTERIZING #BACKWOODS ON INSTAGRAM: "THE NUMBER ONE SELLING ALL NATURAL CIGAR"

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Significance: Cigarillos are popular among youth. We sought to assess the proportion of Backwoods (ITG Brands) cigarillo-related posts to Instagram, a popular platform among youth, that may contain misleading claims, nature-evoking imagery, and appealing flavors. **Methods:** Rules were established to content analyze (n = 1,206) "#backwoods" posts. Categories included Misleading packaging (i.e., the post contained an image of a Backwoods product with the descriptor "natural" on the packaging), Misleading promo (the corresponding caption to the post contained hashtag(s) like "#natural", "#authentic", "#alwaystrue"), Nature-evoking imagery (the post contained images of grass, water, etc., along with a Backwoods product), Flavors (the post containing Backwoods product with brand-specific flavors on the packaging), Flavor promo (the corresponding caption to the post contained hashtag(s) of Backwoods' brand-specific flavors), Marijuana-related (the post contained an image of marijuana next to a Backwoods pack, rolled cigars visibly containing marijuana, or hollowed-out cigars next to marijuana), Smoking (the post contained an image of smoke or a lit cigar), Brand-specific promo (the post contained an image of a Backwoods t-shirt, sweatshirt), and perceived gender. **Results:** Among the 1,206 posts, perceived gender was coded as unable to tell (n = 279 or 23.1%), followed by male (n = 239 or 19.8%), and female (n = 111 or 9.2%), while other posts did not contain images of people (n = 520 or 44.8%). Among all posts, 463 (38.4%) were coded Misleading packaging, 309 (25.6%) were Misleading promo, and 188 (15.6%) were Nature-evoking imagery. Among all of the posts, 564 images (46.8%) were coded Flavors, and 335 (27.8%) were coded Flavor promo (e.g., dark stout, honey, sweet aromatic). Among all images, 645 (53.5%) were Marijuana-related, 165 (13.7%) were Smoking, and 157 (13.0%) were coded as Brand-specific promo. **Discussion:** Misleading images and the depictions of marijuana use in addition to the variety of flavor options may increase product appeal to youth. Study findings underscore the need for comprehensive regulation of cigar products similar to cigarettes.

FUNDING: Federal

P-17

IMPACT OF PICTORIAL VS. TEXT-ONLY CIGARILLO WARNINGS AMONG A NATIONALLY-REPRESENTATIVE SAMPLE OF U.S. YOUNG ADULTS

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Background: Research has demonstrated the superiority of pictorial over text-only cigarette warnings, yet the effectiveness of pictorial warnings for cigarillos has not been examined. **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 (pictorial combined for analyses). For each warning, we assessed perceived message effectiveness (PME), negative emotional reactions, and cognitive elaboration (e.g., this warning helps me understand the risks). We conducted linear regression analyses to compare the effectiveness of pictorial vs. text-only cigarillo warnings. We also examined interactions based on cigarillo user status. **Results:** Participants (N=661) were 46.5% female, 64.7% White, and 22% Hispanic. Most were past 30 day (34.1%) or lifetime (41.4%) cigarillo users, while 24.4% were susceptible nonusers. Pictorial warnings elicited higher PME and more negative emotions than text-only warnings (ps.05). Interactions were found for the impact of pictorial vs. text-only warnings based on cigarillo user status. For past 30-day users, the impact of pictorial warnings on PME (d=0.63), emotions (d=0.99), and cognitive elaboration (d=0.46) was greater compared to text-only warnings, ps<.01. For lifetime users, the impact of pictorial warnings on negative emotions was greater compared to text-only warnings, d=0.45, p<.01. For susceptible nonusers, the impact of pictorial warnings on PME was greater compared

to text-only warnings, d=0.44, p=.01. **Conclusions:** This study provides evidence that pictorial cigarillo warnings were more effective than text-only warnings at inducing negative emotions and increasing PME, which are antecedents to behavior change. Pictorial warnings were also superior to text-only warnings when examining by cigarillo user status. Our findings extend research on cigarette warnings, demonstrating that pictorial warnings are superior to text-only warnings for products beyond cigarettes.

FUNDING: Federal

P-18

A WARNING FOR ALL CIGAR WARNINGS

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Background: Like cigarettes, cigars are combustible tobacco products that pose serious health risks. Efforts to require graphic cigarette warnings in the US have been frustrated by tobacco industry lawsuits. The same is now true regarding cigar warnings. Before the FDA's 2016 deeming rule, cigar warnings were required for major cigar manufacturers. Those requirements, however, are incomplete, and the warnings are marginally impactful. The FDA's deeming rule was intended to improve cigar warnings. Litigation initially delayed and then struck down these warning requirements, likely forcing the FDA to begin a new rulemaking process. **Summary:** This presentation will describe the impact of two court decisions that derailed the FDA's effort to require cigar warnings. Two courts homed in on critical gaps in scientific research that was needed to support legally sound cigar warnings. In one case, a court rejected the FDA's warning requirements for premium cigars because the rule relied on research that was not limited to premium cigars. The court also identified a disconnect between the FDA's concern with youth cigar smokers, who often lack knowledge regarding hazards posed by cigar smoking, and the older age of premium cigar smokers. This troubled the court because there is little evidence that older premium cigar smokers suffer from the same lack knowledge. In a second case, a court broadly struck down all of the deeming rule's cigar warnings because the FDA had failed to meet a statutory requirement of analyzing the regulation's impact on cessation and adoption. This presentation will highlight the research gaps that troubled these courts. Neither of these decisions analyze the content of the proposed cigar warnings, which could raise distinct legal risks. **Conclusion:** There is little research regarding the impact of cigar warnings. Similarly, few cigar studies analyze premium cigar smoking exclusively. Nevertheless, with additional research and a proposed rule that reframes the issues, the FDA may be able to overcome the challenges set forth by these decisions.

P-19

HEALTH EFFECTS THAT APPEAR EFFECTIVE FOR CIGAR WARNINGS: AN EXPERIMENT AMONG ADULT CIGAR SMOKERS

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Significance. Over 4 million adults in the US regularly smoke cigars, which cause multiple cancers and other health effects. While cigars are currently regulated in the US by FDA, courts have struck down FDA's mandated cigar warnings due to a lack of evidence on their impact. To improve cigar warnings and ensure that they can withstand legal scrutiny, research is needed to identify effective cigar warnings. **Methods.** This study examined cigar smokers' perceived message effectiveness (PME) for warnings about different health effects that cigars cause. Between April 23, 2020 and May 7, 2020, we conducted an online study with US adults who used cigars in the past 30 days (n=777). Participants were randomly assigned to view and rate 7 out of 37 possible cigar text warnings about different health effects on 3 PME items. We analyzed PME mean scores (range 3 to 15) to see which health effects were most highly rated and conducted multi-level analyses to assess what characteristics of health effects (e.g., organ system, cancer health effects) were most effective, controlling for repeated measures and participant demographics. **Results.** Warnings about colon cancer, oral cancer, and esophageal cancer had the highest PME scores (mean of 11.4, 11.4, 11.3 respectively), while the lowest scores were about lower sperm count, impotence, and erectile dysfunction (mean of 9.7, 9.6, and 8.4). Multi-level analyses showed that health effects about the cardiovascular system, mouth and throat system, digestive system, respiratory system, and early death were associated with higher PME scores, while health effects related to the reproductive system were associated with lower PME scores. PME scores were not significantly related to health effects mentioning cancer or addiction. **Conclusions.** While some of the health effects in our study that were perceived as most effective are already included in FDA-mandated cigar warnings (e.g., those related to mouth and



throat system), other health effects were perceived as less effective (e.g., those related to the reproductive system). This is critical information for FDA, researchers, and others who are working to develop effective cigar warnings.

FUNDING: Federal

P-20

EXPERTS' PERCEPTIONS OF AND SUGGESTIONS FOR CIGAR WARNING LABEL MESSAGES AND PICTORIALS

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Background: Warning labels can be effective tools to inform the public about tobacco risks. However, tobacco warning research has largely focused on cigarettes. This formative study aimed to explore potential directions for improving the current warnings for cigars, including supplementing with pictorials. Methods: Between June and August 2019, we conducted interviews with ten experts in tobacco warnings, cigars, and tobacco control law, about the current cigar warning statements and requirements, the inclusion of pictorials in cigar warnings, and legal issues. Additionally, interviewees viewed and discussed concept images to pair with existing warning statements, including photographic realistic images and symbolic images (e.g., icons, caution symbols). Results: Experts agreed that cigar warnings should be strengthened (e.g., by increasing their size and use of pictorials) to better leverage their potential impact, and maintain warning parity with cigarettes. However, perceived challenges exist given a variety of cigar products, product terminology and use patterns. Experts agreed that photographic pictorials of health effects are likely to be more salient, informative and effective for behavior change than symbolic ones, but may be vulnerable to legal challenges. Symbolic images used in warnings may obtain attention in a less "controversial" way, but may be considered less serious and "factually accurate," increasing legal risks. Experts indicate that cigar educational campaigns can complement warnings and address additional themes, especially aimed at youth, including exposure to chemicals, flavorings and misperceptions that cigars are "natural". Conclusions: Additional research with consumers is needed to examine the potential public health impact of improving cigar warnings and to support regulatory efforts.

FUNDING: Federal

P-21

THE ASSOCIATION BETWEEN ENDS TAXES AND TOBACCO USE TRANSITIONS

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Significance: Increasing the price of cigarettes through taxation is one of the most effective tobacco control policies. In recent years, many states and jurisdictions in the US have implemented excise taxes on ENDS. It is important to assess how these excise taxes are associated with tobacco use transitions. Methods: We identified tobacco use transitions including quitting smoking, quitting ENDS, transition from exclusive ENDS to smoking, and transition from exclusive smoking to ENDS by following tobacco users in the International Tobacco Control Project Four Country smoking and vaping survey Wave 1 (2016) to wave 2 (2018). We used logistic regressions to assess how the existence of ENDS taxes in a state in Wave 1(2016) is associated with tobacco use transitions in wave 2 (2018), after controlling for sociodemographic characteristics such as age and gender. Results: ENDS users who lived in states with ENDS taxes in 2016, compared to those who lived in states without, were 48% more likely to quit ENDS or use less frequently by 2018. Among them, exclusive ENDS users in states with ENDS taxes compared to their counterparts in states without ENDS taxes were 2.73 times more likely to quit ENDS or use less frequently by 2018. In addition, smokers who lived in states with ENDS taxes in 2016, compared to those who lived in states without, were 1.13 times less likely to start using ENDS or use more frequently by 2018. Among them, exclusive smokers who lived in states with ENDS taxes in 2016, compared to those living in states without, were 1.73 times less likely to start using ENDS by 2018. Conclusions: ENDS taxes are effective in reducing ENDS use among ENDS users but they also deter cigarette smokers from using ENDS.

FUNDING: Federal

P-22

THE BURDEN OF ENDS EXCISE TAXES BY PRODUCT TYPES

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Significance: Increasing taxes has been the most effective policy to reduce cigarette smoking. A growing number of states and local jurisdictions have imposed excise taxes on ENDS to regulate its use among youth and adults. However, unlike cigarettes, there is substantial heterogeneity in ENDS characteristics, including those features most likely to be a basis for taxation: volumes, prices, and nicotine levels. Where any one of these features is used as the base for all ENDS taxation, different prototypes (e.g., disposables, pods, and e-liquid) will bear quite different tax burdens. This study assesses the magnitude of ENDS excise taxes as a percentage of prices under the ENDS tax structures as of July 2020 Methods: We calculated excise taxes as a percentage of retail prices, as a measure of tax burden under current state ENDS tax structures for the following products: a typical 30ml e-liquid sold at 32 cents per ml, a 0.7-ml JUUL pod sold at \$4, and a 1-ml Blu disposable sold at \$7.99, respectively. We also compared the measures of ENDS tax burdens with the tax burden on cigarettes. Results: The results show that currently ENDS may bear higher, same, or lower tax burdens than cigarettes, and that different prototypes have different burdens under the same tax structure. States of Connecticut, New Jersey, New Mexico, and Washington have adopted different tax bases or rates by prototypes that could further alter the relative prices among ENDS prototypes. A federal proposed tax on ENDS based on nicotine levels would impose a tax burden of 2% of retail prices for a typical 6mg/30ml e-liquid bottle, of 28% for a 5% nicotine JUUL pod, and of 16% for a 4.5% nicotine Blu disposable, which are equivalent to 11%, 28%, and 16% of the federal cigarette tax burden (15% of retail price), respectively. Conclusion: Different choices of tax bases will lead to different tax burdens by product types.

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P-23

TAX STRUCTURES OF SUBSTANCES AND IMPLICATIONS IN TOBACCO CONTROL

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Significance: Increasing taxes has been the most effective policy to curb substance use such as tobacco, alcohol, and retail marijuana. A growing number of states have legalized retail marijuana and impose excise taxes on e-cigarettes and retail marijuana. However, different tax structures (bases and rates) will alter the choices of substances through altering relative taxes and prices across substances. This study systematically assesses the magnitude of excise taxes as a percentage of prices under the tax structures as of July 2020 for tobacco (e-cigarettes and cigarettes), beer, and retail marijuana. Methods: We calculated excise taxes as a percentage of retail prices, as a measure of tax burden under current state tax structures and describe the rationality of imposing taxes based on the harm-inducing or common chemical (THC, ethanol, and arguably nicotine). Results: The results show that cigarette taxes account for a significantly higher percentage of retail prices, as compared to beer. The relative tax burdens across retail marijuana, e-cigarettes, and cigarettes depend on states and localities. As the prices of e-cigarettes and retail marijuana continue to drop, the tax burdens under an ad valorem tax system (as a % of wholesale or retail price) remain the same or further drop, which fail to sufficiently raise prices. Taxes based on THC and ethanol will be more effectively reduce the consumption of harm-inducing chemicals. Conclusion: Different choices of tax bases and rates for different substances will alter relative taxes and prices, which may alter downstream behavioral outcomes. The effectiveness of taxes based on chemicals depend on whether the common chemicals are harm-inducing.

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P-24

CHANGES IN E-CIGARETTE UNIT SALES IN THE UNITED STATES DURING JANUARY 2019-MARCH 2020

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Objective: Approximately 28% of high school students reported current e-cigarette use in 2019, according to the National Youth Tobacco Survey. On January 2, 2020, the US Food and Drug Administration issued guidance prioritizing enforcement against certain unauthorized flavored e-cigarette products. We assessed e-cigarette sales in the U.S. during January 2019-March 2020. Methods: Scanner data from the Nielsen Company for January 2019-March 2020 were used. These data include sales in convenience stores,



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food/grocery stores, pharmacies, mass merchandisers, club stores, discount/dollar stores, and US military commissaries in the 48 contiguous US states and DC. Internet and vape shop sales are not included. E-cigarettes were categorized as disposable, prefilled pods/cartridges, and e-liquids. Unit sales in 4-week periods from January 26, 2019 through March 21, 2020 were analyzed. Average percent changes in unit sales were calculated between quarter 1 2019 and quarter 1 2020, and quarter 4 2019 and quarter 1 2020. Results: Pod/cartridge product sales decreased 16% from Q1 2019 (13,344,433 units) to Q1 2020 (11,205,362) and decreased 19% from Q4 2019 (13,775,449) to Q1 2020. Sales of tobacco and menthol flavored pods/cartridges increased (22% and 155%, respectively) from Q4 2019 to Q1 2020, accounting for 97% of all pods/cartridge sales in March 2020 (60% menthol and 37% tobacco). Overall sales of disposable e-cigarettes increased 43% from Q1 2019 (1,575,271 units) to Q1 2020 (2,256,128) and 29% from Q4 2019 (1,748,709) to Q1 2020. Most flavored disposable e-cigarettes showed increases over time; increases were statistically significant for beverage, menthol, "other", and not stated flavors. From Q1 2019 to Q1 2020, sales of e-liquids decreased by 89% (38,418 to 4,062 units). Conclusions: Sales of pod- or cartridge-based e-cigarettes decreased, and sales of disposable e-cigarettes increased during January 2019-March 2020. Among pod or cartridge-based e-cigarettes, menthol- and tobacco - flavored product sales have increased. Continued monitoring of e-cigarette sales, and related drivers, can inform tobacco control and prevention strategies.

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P-25

QUALITATIVE ANALYSIS OF SOCIAL MEDIA DISCUSSIONS ABOUT FLAVORED E-CIGARETTES DURING 2019-2020

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Significance: Flavors play a key role in tobacco product use initiation and sustained use among youth. On January 2, 2020, the U.S. Food and Drug Administration (FDA) issued guidance prioritizing enforcement, beginning February 6, 2020, against certain unauthorized flavored cartridge-based e-cigarettes other than tobacco- or menthol-flavored products. **Methods:** We collected data posted on Reddit from February 7, 2019 to March 15, 2019 and February 7, 2020 to March 15, 2020 to examine differences in discussions about flavors in e-cigarettes. A content analysis was conducted using Atlas.ti to identify themes related to the use of flavors in e-cigarettes. **Results:** Among the sample (n=1,845), posts about flavors in e-cigarettes were more common in 2020 (62%) than in 2019 (51%). Menthol, tobacco, and fruit were the most common flavors mentioned during both years. About 3% of posts in 2019 and 8% of posts in 2020 mentioned do-it-yourself flavors. Moreover, posts on refilling pods with flavored juices were more common in 2020. A prefilled pod-based e-cigarette product was the most mentioned during both years; however, discussions of the product declined in 2020 and often pertained to seeking advice about flavors and switching to other devices with more flavor options. Discussions about refillable e-cigarettes and other open systems were more common in 2020 than 2019 and were referenced often within the context of providing more flavor options than closed/prefilled devices. Disposable e-cigarettes were rarely discussed in 2019 but were commonly mentioned in 2020. About 7% of posts in 2020 mentioned switching to other products, primarily to devices with more flavor options. About 10% of posts mentioned use of flavors to quit smoking and expressed concerns about FDA enforcement guidance extending to other e-cigarette devices and flavors. **Discussion:** Discussions on social media suggests that e-cigarette users may be seeking alternative devices with more flavor options. Social media data can provide insight on potential changes in tobacco product use behaviors that can be further assessed with more rigorous quantitative methods.

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P-27

ESTIMATED JUUL LABS' RETAIL REVENUES FROM YOUTH AGED 12-17

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Significance: Past 30-day e-cigarette use increased by 78% among high school youth from 2017 to 2018. Since first marketed in 2015, JUUL has become increasingly popular, accounting for nearly 75% of the market share in the US in 2018. It was reported that youth aged 15-17 are 16 times more likely to use JUUL compared with those aged 24-35. In this study, we estimate JUUL Labs' net revenue in 2018 attributable to youth

use in the US. **Method:** We calculated the number of youth (aged 12-17) and adults (aged 18+) who reported using JUUL based on data from the Population Assessment of Tobacco and Health (PATH) Study wave 4 (Dec 2016 - Jan 2018). Youth JUUL owners were defined as respondents aged 12-17 years who were past 30-day electronic nicotine product users and stated "JUUL" as the name of the brand of electronic nicotine product they usually use or last used. Current adult JUUL owners were defined as respondents who have ever used an e-cigarette and stated "JUUL" as the name of e-cigarette brand they own. Based on the percentage of youth among JUUL users, we then applied several scenarios to estimate JUUL Labs' net revenue from youth in the US in 2018. **Results:** Based on data from the PATH Study, we estimated 31 percent of JUUL users were youth (12-17 years). JUUL Labs' net revenue was \$1.3 billion in 2018, according to Bloomberg.com. We calculated that JUUL Labs made approximately \$390M (30%) of its net revenue in 2018 from youth. This amount could range between \$130M (10%, assuming the proportion of youth JUUL users is 20% less than the PATH estimate) and \$650M (50%, assuming the proportion of youth JUUL users is 20% more than the PATH estimate). **Conclusion:** Youth represent an important proportion of sales of JUUL in 2018 and therefore a substantial proportion of the companies' profits in 2018 were a result of use by youth. As part of policies to prevent e-cigarette companies from attracting youth users nationwide and reverse the rise in youth e-cigarette use, it could be required that all e-cigarette companies actively ensure that youth use is below a small pre-determined fraction of their sales, requiring that a high penalty be paid by those that fail to do so.

FUNDING: Federal

P-28

PREVALENCE AND CORRELATES OF SUPPORT FOR VAPING POLICIES AMONG ADULT SMOKERS AND DUAL USERS IN MEXICO, WHERE VAPING IS BANNED

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Introduction: This study described the level of support for different vaping policies among adult smokers and vapers in Mexico, where vaping devices are currently banned. **Methods:** We analyzed cross-sectional data (N=3,870) from an online survey of Mexican adult exclusive smokers (n=2,525) and dual users (n=1,345) recruited from a marketing research panel from November 2018 to March 2020. We evaluated five regulatory proposals: flavor ban (FB); aerosol-free spaces (AFS); minimum age to buy restrictions (MABR); marketing ban (MB); and the current ban (CB). Adjusted logistic regression models were estimated to assess the relationship between each vaping policy and smoking and vaping frequency, social norms (family and/or friends who vape), vaping risk perception relative to cigarettes, smoking cessation intentions, and sociodemographic. We use national survey weights for sex, age, education, and vaping distribution among adult smokers. **Results:** The prevalence of five regulatory proposals was: FB, 18.5%; AFS, 38.3%; MABR, 46.6%; MB, 23.2%; and CB, 16.7%. Older age (50+) was positively associated with support to FB (AOR=2.91, 95%CI=1.23-6.91); AFS (AOR=3.71, 95%CI=1.51-9.12); MB (AOR=3.52, 95%CI=1.36-9.12); and CB (AOR=3.63, 95%CI=1.27-10.36). Planning to quit in the next six months was associated with a greater likelihood to support all the policies: FB (AOR=2.40, 95%CI=1.25-4.58); AFS (AOR=2.31, 95%CI=1.35-3.94); MABR (AOR=3.63, 95%CI=1.90-6.92); MB (AOR=2.86, 95%CI=1.61-5.09); and CB (AOR=1.98, 95%CI=1.05-3.73). Compare with exclusive smokers, occasional dual users with cessation attempts were more likely to support the FB (AOR=5.24, 95%CI=1.99-13.83) and MB (AOR=2.81, 95%CI=1.19-6.63). Frequent dual users without cessation attempts were less likely to support FB (AOR=0.28, 95%CI=0.14-0.55). Perception of vaping as less harmful than cigarettes increase rejection to CB (AOR=0.24, 95%CI=0.12-0.47). **Conclusions:** In the potential replacement of the current ban, groups such as older smokers and those who intend to quit, will be strategic in the discussion on how to regulate these products. *This study was supported by 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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P-29

A CONTENT ANALYSIS OF PUBLIC COMMENTS ON MODIFIED RISK TOBACCO PRODUCT APPLICATIONS SUBMITTED TO THE FDA

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Significance: Under a new regulatory process, tobacco companies can submit "modified risk tobacco product" (MRTP) applications to the US Food and Drug Administration (FDA) to make modified risk claims in their product marketing. Claims for two brands have been authorized and other decisions are pending. In making its decisions, FDA considers data presented in applications, its own scientific review, advisory board input and electronically submitted public comments. This presentation will describe major arguments used in these public comments to date. **Methods:** We conducted a content analysis of a sample of 226 comments submitted about the applications for General Snus (n=58), Camel Snus (n=34), Copenhagen (n=54) and IQOS (n=76), retrieved from regulations.gov. Analyses focused on comment features (e.g., author, length, slant) and argument themes. **Results:** Most (61%) comments supported claim authorization, 23% were opposed, 10% had an unclear position, and 6% were not applicable. Leading arguments in supporting comments included that the applicant product is less harmful than smoking/can reduce harm (86%), that the public needs to be informed about relative risks (55%) and that claim authorization would be consistent with stated FDA visions (40%). Most supportive comments were authored by private citizens (30%), industry advocates/trade groups (12%), wholesalers/retailers (12%), and tobacco growers (10%). About 12% were from researchers, health professionals or public health groups. Leading opposing arguments included concerns about product health risks (67%), dual product use (54%), youth appeal (46%) and problems with the applicant's claims (42%) and study designs (40%). About 46% of opposing comments argued that the applicant did not meet the standards for MRTP authorization. About 75% of opposing comments were from researchers, health professionals or public health groups, while 23% were from private citizens. **Conclusions:** Support for MRTP applications and harm reduction themes have been prevalent in public comments to date. Comments provide opportunities to engage with FDA in decision making and should continue to be utilized, including by researchers.

FUNDING: Federal

P-30

TOBACCO FLAVOURING AND DESIGN FEATURES NEAR SCHOOLS BEFORE PLAIN PACKAGING IN URUGUAY

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Significance Marketing strategies are constantly being developed by tobacco industry, to reach new consumers such as children and youth. One of these strategies is marketing through design appeals and flavours. Uruguay is the second country to implement plain packaging legislation for cigarettes in the Americas. This study aims to explore flavouring and design features of tobacco products available near schools immediately before the implementation of plain package in Uruguay. **Methods** Fieldwork protocol was adapted from the one developed at Johns Hopkins University and implemented in fifteen neighbourhoods in Montevideo, Uruguay, across different socioeconomic areas. A high school was selected per neighbourhood as the hub, from which the protocol was started. We surveyed retailers, purchased tobacco, and coded according to its characteristics. **Results** A total of 23 unique tobacco products were purchased. Appealing design features were found in 17 of the 23 packs, and 8 of the 23 products were flavoured cigarettes. Flavoured cigarettes lacked the child protection warning in a greater proportion than non-flavoured ones. Also, flavoured products were available in at least one retailer for across all socioeconomic levels. The most frequently found filter designs concerned the activation of flavour with ball or capsule designs (7/21), and features meant to imitate technological symbols that appeal to youth (3/21). **Conclusion** Our study shows an increase in availability of flavoured cigarettes in Uruguay immediately before plain packaging implementation according to previous report. However, proliferation of flavoured packs is much lower than other countries in the region, possibly attributable to the single presentation requirement. In countries developing plain packaging legislation flavour proliferation and modification of design features must be especially monitored and addressed.

FUNDING: State

P-31

SMOKERS' PERCEPTIONS OF DIFFERENT CLASSES OF CIGARETTE BRAND DESCRIPTORS

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Significance: Cigarette brand descriptors such as "light" have been banned but have been replaced by colors and other descriptors (e.g., smooth) that continue the misperception of reduced harm of certain cigarettes. This study provides a closer examination of how product descriptors are perceived by consumers by assessing responses across four classes of brand features. **Methods:** Daily cigarette smokers (N=88) participated in semi-structured interviews to rank 32 currently legal cigarette brand descriptors used in four brand features 1) prestige (i.e. status; 5 descriptors); ii) connotation (i.e. brand image; 8 descriptors); iii) taste (9 descriptors) and iv) color (10 descriptors). Participants ranked descriptors within each brand feature on perceptions of harm, attractiveness, and appeal (willingness to try). Descriptive analyses included median rankings and percentage of participants that ranked each descriptor as most/least harmful, attractive, and appealing. Chi-square was used to assess demographic effects on descriptor perceptions. Spearman's correlation was used to assess the association between rankings of harm, attractiveness, and appeal. **Results:** Brand descriptors influenced perceptions of harm, attractiveness, and appeal within each brand feature. Of the color descriptors, White was perceived as least harmful while Red and Black were perceived as more harmful. Among the taste descriptors, Smooth was ranked the most appealing and attractive. Perceptions of certain descriptors differed by demographic characteristics such as sex and age, though systematic effects were not observed. Rankings of attractiveness and appeal ($r = 0.63, p < .001$) were more strongly correlated than rankings of harm and appeal ($r = 0.20, p < .001$). **Conclusion:** Cigarette manufacturers replaced banned text descriptors with many newer terms that continue to influence perceptions of cigarette harm and appeal. Regulatory agencies should closely evaluate all brand descriptors and consider implications for emergent products with fewer regulations such as electronic cigarettes.

FUNDING: Federal

P-32

TESTING DISCLOSURE STRATEGIES FOR E-CIGARETTE INFLUENCER POSTS ON SOCIAL MEDIA

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Youth and young adults are the largest consumers of social media content. Individuals with large numbers of followers (known as "influencers") are sometimes paid to share social media content related to specific products. This activity is considered commercial sponsorship and requires disclosure to comply with Federal Trade Commission regulations. This study tested whether young people paid attention to and recognize posts as commercially sponsored content. **Methods:** During July-August 2019, youth and young adult (ages 16-24; n=200) participants were recruited to view their native Instagram feed on a laboratory mobile device. A set of four experimental posts from e-cigarette influencers was inserted into the user's feed with one of two potential labeling strategies: #ad or #sponsored. Two control posts without any sponsorship-related labeling were also inserted to capture general attention to e-cigarette influencer posts. Analyses compared visual attention (in seconds) to the area of interest (AOI) surrounding #ad versus #sponsored and compared recognition of commercial content by study condition. **Results:** On average, participants spent 6.6 seconds and 8.4 seconds viewing the entire labeled e-cigarette influencer post and control post, respectively. Youth and young adults spent 3.1 seconds on the AOI around #ad, compared to 2.2 seconds on the #sponsored AOI (p=0.03). After accounting for age, tobacco use, and dependence, #ad drew 0.93 seconds more than #sponsored (p=0.02). After accounting for current tobacco use, dependence, and health literacy, the #ad condition had nearly twice the odds of commercial recognition compared to #sponsored (OR=1.98, CI: 1.14-3.38). Every second of attention paid to the hashtag significantly increased the odds of commercial recognition by 22% (OR: 1.22, CI: 1.00-1.33). **Conclusion:** Although both hashtags attracted attention, #ad significantly increased recognition of commercial sponsorship from young social media users. These findings demonstrate that labeling commercially sponsored content on social media is a promising strategy to better inform users about paid social media influence.

FUNDING: Other



P-33

THE MARLBORO MAN IS STILL ALIVE AND WELL IN BRAZIL: STRAW CIGARETTES AND MASCULINE BRANDING

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Background Straw cigarettes are handmade cigarettes unique to Brazil, in which tobacco is rolled in a corn straw. Because these types of cigarettes are seen as natural, there is an inaccurate belief that they are less harmful. Historically, these cigarettes have been consumed more in rural areas and by men. However, recent media coverage indicates a switch in the profile of straw cigarette users to young people in urban areas. This study assessed the marketing appeals of straw cigarette packaging in Brazil. **Methods** The Tobacco Pack Surveillance System systematically collects unique tobacco packs sold in low- and middle-income countries with high tobacco use. Packs purchased in 2013, 2016, and 2019 from Manaus, Salvador, and Sao Paulo were double-coded for marketing appeals (flavor, less harm, masculinity, luxury and quality). **Results** The number of unique straw cigarette packs collected increased over time: they comprised 2.3% (n=3), 1.3% (n=2) and 15.5% (n=27) of the unique sample in 2013, 2016 and 2019, respectively. While we did not observe any packs with flavors in 2013 and 2016, 48.1% of the straw cigarette packs were flavored in 2019. Flavors included menthol, coconut, cinnamon and grape. 31.2% of the packs presented a less harm appeal (two out of three packs in 2013, neither of the 2016 packs, and 29.6% (n=8) in 2019). 93.8% of the packs were described as "artisanal"; 31.3% had images of a crown/laurel wreath/crest; 25.0% mentioned different editions (e.g. gold/premium); and 18.8% used the term "traditional". The most prominent marketing appeal, consistently used across the years, was masculine imagery (56.2%), including images of men (e.g. cowboys, men playing guitar) and car racing. **Conclusion** Besides the increase in available brands and variants of straw cigarettes, we identified the presence of strong masculine branding on the packs. Much of the images resemble the iconic *Marlboro* cowboy and his symbolism of masculinity and strength. The increase in the proportion of packs with flavors and less harm appeals is of particular concern regarding youth. The Brazilian government should include a question about straw cigarettes in its tobacco use surveillance. **Funding** This work was supported with funding from Bloomberg Philanthropies' Bloomberg Initiative to Reduce Tobacco Use (bloomberg.org)

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REDUCED HARM CLAIMS IN ORAL NICOTINE DIRECT-TO-CONSUMER MAIL ADVERTISING (US, MARCH 2018-MAY 2020)

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Major tobacco companies have renewed investment in marketing tobacco leaf-free oral nicotine products in the form of mint or fruit flavored pouches, gum, and tablets to US consumers. These products are not approved nicotine replacement therapies nor are they authorized for sale as a modified risk product by the US Food & Drug Administration (FDA). Nonetheless, companies may use claims like "tobacco free" or similar which could suggest oral nicotine is a less harmful product. The current study examines trends in oral nicotine direct-to-consumer-mail advertising, including the presence and type of potential reduced harm claims. We acquired a 2.5 year (March 2018-May 2020) sample of US direct-mail advertisements (n=50) from Mintel Comperemedia. Two reviewers double-coded ads for reduced harm claims that suggest oral nicotine is less harmful to use (e.g. "tobacco free," "clean/cleaner," etc). Overall reliability was high. The proportion of ads with potential reduced harm claims by major tobacco company (Altria, RJ Reynolds) was calculated. From March 2018 to May 2020, 39 million pieces of direct-mail advertising oral nicotine were sent to US consumers. Most (58%) of the direct-mail in this sample was sent by Altria (58%) vs. RJ Reynolds (42%). Overall, 68% (n=34 ads) of all oral nicotine direct-mail ads contained potential reduced harm claims. Approximately 24% of RJ Reynolds ads and 100% of Altria oral nicotine ads contained reduced harm claims. The most prominent claims included: "spit-free, smoke-free" (n=19 ads, all Altria), "no lighters, no chargers, no mess" (n=5 ads, all RJ Reynolds) and "tobacco-leaf free" (n=3, RJ Reynolds; n=1, Altria). Most oral nicotine direct-mail ads in the study sample included potential reduced harm claims. Terms such as "smoke-free" and "tobacco-free" were frequent and could signify reduced harm to current combustible tobacco users and novice users alike. Phrases like "no mess" may imply that a product is cleaner,

and possibly healthier, to use versus other tobacco products. Results can inform FDA's authority to prohibit marketing oral nicotine with misleading "modified risk" or reduced harm claims without proper approval.

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ATTENTIONAL BIAS IN TOBACCO PRODUCT ADVERTISEMENTS: THE IMPACT OF FLAVORED FEATURES AND HEALTH WARNING LABELS

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Significance: Tobacco users are known to pay attention to warning labels on tobacco packaging and advertisements (ads). Few studies have examined differences in attention to flavored vs. non-flavored product ads. The aim of this study was to compare attention to areas of interest (AOIs) identified in tobacco product ads with flavored/non-flavored content and warning labels. **Methods:** Data were drawn from an experimental eye-tracking study of young adult tobacco users (n=74) shown tobacco ads, including seven ads that featured flavored tobacco products (cigarettes, smokeless, e-cigarettes and cigarillos). AOIs were drawn around ad elements featuring images or descriptors and were coded for type: 1) flavored content, 2) non-flavored content (including tobacco flavor), and 3) warning label. Attentional bias, measured as dwell time (DT) in milliseconds (ms) and number of visits to AOIs, was compared across AOI types using mixed effects regression models. **Results:** Attention did not differ by participant characteristics, but differed by product type featured in the ad, with greatest attention paid to AOIs in ads featuring smokeless tobacco products. The majority of AOIs contained flavored content (54.4%), followed by non-flavored content (23.9%) and warning labels (21.7%). When accounting for nesting of AOIs in ads and respondents and controlling for product featured in the ad, mean DT was 430.2 ms higher (p<0.05) for warning labels compared with non-flavored content; there was no difference in DT between flavored and non-flavored AOIs. Mean visits to warning label AOIs was 1.7 times (p<0.0001) the rate of visits to non-flavored AOIs, while flavored AOIs had 0.9 times (p<0.05) the rate of visits to non-flavored AOIs. **Conclusions:** Young adults focused more on the warning label than the content of the ad (flavored or non-flavored). DT did not differ by flavored/non-flavored content, but participants visited flavored content less frequently than non-flavored content. Encouragingly, warning labels dominated young adults' attention in this study. Future studies should explore whether these viewing patterns impact use of or intention to use tobacco products.

FUNDING: Federal

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THE IMPACT OF VARYING E-CIGARETTE ADVERTISEMENT WARNING COLOR - RESULTS FROM AN ONLINE EXPERIMENT AMONG YOUNG ADULTS

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Significance Tobacco advertisement warnings are often overlooked, which reduces the opportunity for risk communication. We examined the effect of varying warning color on increasing attention and recall, and reducing ad appeal. **Methods** We used Prolific to survey 1,170 young adults (18-34) who currently used or were susceptible to using e-cigarettes. We randomized participants to one of four warning conditions: black text on white background (BW), white on black (WB), black on yellow (BY), and yellow on black (YB). Participants viewed three e-cigarette advertisements varying in brand and design, each containing the FDA-mandated nicotine warning text. After viewing each ad, participants responded to items about the ad. After viewing all three ads they responded to items about the warning. We examined associations between condition and attention, recall, perceived message effectiveness, ad appeal, and intentions to use e-cigarettes using chi-square and ANOVA where appropriate. **Results** The warning was selected as the most attention-capturing part of the advertisement more often by those exposed to YB (56.4%) or BY (63.9%) warnings than those exposed to WB (45.9%) or BW (47.0%) warnings (p<.001). Most selected the correct warning in aided recall (79.5%), though it was not statistically significant between those exposed to the yellow warnings (81.5%) and those exposed to white (77.0%; p=.06). In open-ended recall, 41.0% of respondents recalled the concept, 40.1% recalled part of the warning; these did not vary significantly by condition. Notably, 7.2% provided responses that showed evidence of misinformation, including that nicotine causes cancer or that the warning was about smoking. We did not find differences by condition for perceived message effectiveness, ad appeal, or



intentions to use. **Conclusions** Yellow warning color increases attention to the warning, but this increase in attention did not translate to increases in recall or changes in other downstream effects such as increased perceived message effectiveness, decreased ad appeal, and decreased intentions to use.

FUNDING: Federal

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HOW YOUTH ARE LEFT VULNERABLE TO THE TOBACCO INDUSTRY WITHOUT A BAN ON FLAVORED CIGARS

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Significance: For four years, the FDA has stated its intent to ban flavored cigars. However, it has still not issued a proposed rule to date. An updated review of the science is necessary to better understand the issues surrounding flavors in cigars now that FDA can regulate these products. **Methods:** This study consisted of a systematic review via a PubMed search of all scientific literature on cigars published after the 1998 National Cancer Institute's Tobacco Control Monograph 9, Cigars: Health Effects and Trends. **Results:** Data from national surveys shows that the prevalence of flavored cigar use is higher in youth and young adults than adults and youth are smoking flavored cigars at rates higher than cigarettes. 65.4% of youth ever users of any cigar type reported that the first product they had used was flavored and 73.8% of these youth reported product flavoring as a reason for use. Among current cigar smokers, 43.2% of high school students and 36.1% of middle school students used a flavored cigar in the past 30 days. Flavored use is associated with lower intentions to quit smoking among youth cigar smokers. Internal industry studies confirm that flavors increased the appeal of little cigars and cigarillos to new tobacco users by masking the heavy cigar taste, reducing throat irritation, and making the smoke of little cigars and cigarillos easier to inhale. The removal of flavored cigars from the market would result in an estimated 800 fewer cigar smoking-attributable deaths in the U.S. each year. **Conclusion:** The cigar market is heavily flavored and flavored cigar use is especially high among youth and young adults. The FDA should immediately prohibit characterizing flavors in cigars. Until the FDA does so, state and local governments can and should enact policies that restrict the sale of flavored tobacco products, including cigars.

FUNDING: Other

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COLORFUL AND CLOSE TO CANDY - THE TOBACCO INDUSTRY'S PRACTICES AT THE POINT OF SALE

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Significance: Tobacco companies make extensive use of the retail environment to reach both current and future customers by advertising and promoting their products and normalizing the presence of tobacco products in everyday life. **Methods:** This study consisted of a search of literature on point of sale policies in the United States. These policies were restricted to tobacco retailer licensing and density, price discounting, and in-store promotion and placement. **Results:** The largest U.S. cigarette and smokeless tobacco manufacturers spent over \$8.7 billion in 2018 on advertising and promotional expenditures in the retail environment, including advertisements posted at the retail location, price discounts, promotional allowances, coupons, and sampling. The advertising and promotional efforts of tobacco companies in the retail environment contribute to the initiation and progression of tobacco use among young people. Tobacco retailers are also often more heavily populated in areas with a greater number of minority and low-income populations. Tobacco companies use a variety of methods in the retail environment, including:

- Reducing the prices of their products to circumvent higher taxes by dropping wholesale prices and employing tactics such as couponing, multipack discounts (e.g. buy-two-get-one-free or buy-two-for-one deals) and price discounts (e.g., \$2.50 off one pack);
 - Promoting products in the retail environment by using displays and advertisements and providing retailers with incentives for advertising their products; and
 - Paying retailers to strategically place tobacco products front-and-center in retail environments which are easy-to-see for customers, often around the checkout counter.
- Conclusion:** Regulation of point of sale tobacco marketing practices are not as widespread or commonly employed as taxation or clean indoor air laws; however, evidence suggests they are potentially powerful and underutilized policy options.

FUNDING: Other

P-39

ONLINE ENDS MARKETING AND CLAIMS AMONG BRICK-AND-MORTAR VAPE SHOPS IN LOS ANGELES

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Significance: Most ENDS marketing research has assessed brand websites and less is known about vape shop websites. Vape shops may be marketing ENDS similar to brand websites, which can influence ENDS users' attitudes and behaviors. This study assessed the websites of vape shops in the Greater Los Angeles Area to describe online marketing and claims made about ENDS. **Methods:** A total of 104 brick-and-mortar vape shops were identified, and 38 shops were found to have active websites. From March 25, 2020 to June 25, 2020, two coders independently analyzed website content. Coding categories included *Age Verification* (the presence or absence of a pop-up window to verify age for access to the website), *Social Media* (the presence or absence of external links to social media sites like Facebook and Instagram), *Nicotine Warning Label* (presence or absence of nicotine addictiveness warning statement or product packages and advertisements on the website), *Advertised ENDS* (cigalikes, eGos [popular tubular device], mods [box shaped], pods [flash drive shaped]), *Advertised Brands* (ENDS advertised on the website with a distinct name or logo), and the number of *Advertised Flavors* (i.e., < 50 or ≥ 50) and *ENDS Claims*. ENDS Claims included ENDS as quitting aids; a disclaimer that ENDS are not approved as cessation devices; ENDS are healthier/safer than cigarettes; and ENDS have social benefits compared to cigarettes (less expensive, can be smoked anywhere, cleaner or less messy/smelly, more socially accepted). **Results:** Among the 38 websites, 22 (56.4%) had *Age Verification*, 21 (55.2%) had external links to *Social Media* sites, and 26 (68.4%) had *Nicotine Warning Label*. *Advertised ENDS* were eGos (25; 65.7%), mods (24; 63.1%), pods (22; 57.8%), vape pens (9; 23.6%), and cigalikes (9; 23.6%). The top 10 *Advertised Brands* were SMOK, Geek Vape, Lost Vape, Suorin, FreeMax, UWELL, VOOPOO, Aspire, Vapresso, and Horizon Tech. A total of 26 (68.4%) websites had at least 50 *Advertised Flavors*. *ENDS Claims* included ENDS as quitting aids (13; 34.2%); a disclaimer that ENDS are not approved as cessation devices (12; 31.5%); ENDS are healthier/safer than cigarettes (17; 44.7%); and ENDS have social benefits compared to cigarettes (i.e., less expensive (8; 21.1%), can be smoked anywhere (5; 13.1%), cleaner or less messy/smelly (8; 21.1%), more socially accepted (6; 15.7%). **Conclusion:** In Los Angeles, a majority of vape shop websites have age verification, external links to social media sites, and nicotine warning labels. Most shops are advertising eGos, mods, and pods, and at least 50 unique flavors. Common claims are ENDS as healthier/safer than cigarettes, ENDS as quitting aids, and a disclaimer that ENDS are not approved as cessation devices. These claims may influence consumers' attitudes and behaviors. Continued surveillance research on, and regulation of, vape shops' online marketing and claims will be necessary.

FUNDING: Federal

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VAPING CESSATION RESOURCES ON NORTH AMERICAN QUITLINE CONSORTIUM WEBSITES

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Vaping (e-cigarette use) among youth has reached epidemic proportions despite steady declines in traditional smoking. Research increasingly indicates that many of the appealing vaping product flavorings are toxic, but dissemination of these harms remains limited. In the United States vaping has recently turned deadly with thousands of cases of e-cigarette or vaping associated illness (EVALI) and death. More resources for vaping cessation are needed to combat this newer epidemic of nicotine addiction among youth. In a previous study (January, 2020), the authors examined all NAQC (North American Quitline Consortium) member "quitsites" to identify and characterize information pertaining to vaping cessation across all 50 U.S. states, all 13 Canadian provinces, 3 U.S. territories and Washington D.C. Currently, there are additional concerns that e-cigarette users may be at greater risk for succumbing to Covid-19, which is an acute respiratory disease that attacks the lungs. The present study further analyzed the NACQ quitsites 1) to identify updates to information and resource related to vaping cessation, and 2) to determine whether or not quitsites provide information about COVID-19 concerns in relation to vaping. Although 41 of 66 quitsites (62%) presented information on the harms of vaping, only 21 (31.8%) had messaging to indicate that flavors are harmful, and 23 (34.8%) provided information related to COVID-19 and vaping. Of the 66 sites, 26 (39.3%) recommended speaking to a health care provider, although some websites included information and resources targeting healthcare providers and patient referral. Although ongoing research is needed to track this trend, an increase in the number of



quitsites that include information on the harms of vaping (and specifically vaping flavors) and resources for vaping cessation was observed. The inclusion of information about the association between vaping and COVID-19 may also continue to increase as new research comes to light.

FUNDING: Federal

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TOBACCO CESSATION IN LOW TO MIDDLE INCOME COUNTRIES A SCOPING REVIEW OF RANDOMIZED CONTROLLED TRIALS

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Significance The growing prevalence of tobacco use in low-to middle-income countries (LMICs) and the hurdles of conducting tobacco cessation in that context necessitates a focus on the scope of randomized controlled trials (RCTs) in LMICs to guide tobacco cessation in this environment. We conducted a scoping review to identify LMIC tobacco cessation RCTs. **Methods** Consistent with PRISMA-ScR guidelines and without language restrictions, we systematically searched peer-reviewed databases (MEDLINE, Embase, PsycINFO, articles published since inception, latest searches in March 2020) and gray literature (clinical trials registries, searches between September and December 2019). We searched for data on RCT type, outcome significance and intervention description. **Inclusion:** research conducted in LMICs; tobacco cessation; RCT. **Exclusion:** research conducted in high income countries; non-RCT; studies involving only those aged <18. Data was extracted from published reports. We generated narrative summaries of each LMIC's tobacco cessation RCT research environment. Results Of 8404 articles screened, we identified 92 studies. Tobacco cessation RCTs were recorded in 16 of 138 countries/territories in LMICs. Evidence was weak in quality and severely limited. Most RCTs were psychosocial, with limited behavioral and pharmacological variants. **Conclusions** Tobacco control within LMICs is essential to reduce the tobacco mortality burden. Researchers should be cognizant that tobacco cessation in LMICs is still not an environment where best practice has been established. We suggest that developing solutions specific for LMICs is key to effective tobacco control in LMICs.

FUNDING: Nonprofit grant funding entity

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PERCEIVED CREDIBILITY AND EFFECTIVENESS OF FOUR GRAPHIC HEALTH WARNING LABEL ATTRIBUTION SOURCES AMONG CHINESE ADULTS

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Article 11 of the Framework Convention on Tobacco Control recommends including an attribution source for pictorial health warning labels (HWLs) but little is known regarding the perceived credibility and effectiveness of different attribution sources. This study examined perceptions of four different HWL attribution sources among adults in China - the world's largest consumer of cigarettes. Data were collected in 2016 from an online convenience sample of 1,999 adults; 80% of the sample were current smokers. Participants viewed four versions of the same HWL, each with a different message attribution source: the China CDC [ref. group]; China's domestic tobacco regulatory body; Liyuan Peng, China's first lady; and the World Health Organization (WHO). Respondents indicated which HWL was the most 1) credible, 2) effective at making people quit, and 3) effective at preventing youth initiation. Multinomial logistic regression models estimated adjusted relative risk ratios (aRRR) of the three outcomes. Controlling for participant demographics and smoking status, the HWLs attributed to China's domestic tobacco regulatory body and to Liyuan Peng, respectively, were perceived as significantly less credible (aRRR=0.59, $p<0.5$; aRRR=0.52, $p<0.5$), less effective at making people quit (aRRR=0.32, $p<0.5$; aRRR=0.49, $p<0.5$), and less effective at preventing young people from smoking (aRRR=0.49, $p<0.5$; aRRR=0.42, $p<0.5$) than the HWL from the China CDC. There were no significant differences in perceived credibility and perceived effectiveness of the HWL in preventing youth initiation of the HWL attributed to WHO versus the China CDC. However, participants viewed the HWL from the WHO as less effective at making people quit (aRRR=0.58, $p<0.5$) than the HWL from the China CDC. In China, HWLs attributed to the China CDC were viewed as similarly credible as messages attributed to the WHO. The China CDC was also the most effective messenger for influencing smoking behavior compared to other national message sources, suggesting the unique role of health organizations in conveying smoking-related messages. Findings can inform global recommendations regarding attribution sources.

FUNDING: Nonprofit grant funding entity

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INTERNATIONAL VAPING CESSATION INFORMATION AND RESOURCES ON WEB-ASSISTED TOBACCO INTERVENTIONS

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Globally, there has been an increase in the use of Electronic Nicotine Delivery Systems (ENDS) as an aid in abstinence from other tobacco products. In 2017 study in France, Switzerland, and Belgium, 28% of respondents who vaped reported no need to discontinue vaping, as it was perceived to have helped them quit smoking cigarettes. A 2018 global online survey reported that 96.6% of electronic cigarette users had no intention of quitting as they saw vaping as a healthier alternative to smoking. The health risks of vaping are becoming increasingly clear. Promoting ENDS products as a tobacco cessation aid may be pushing smokers from one addictive substance to another. The promotion of evidence based strategies and resources for cessation is understudied. The present study evaluated one consistent source of cessation strategies and resources across many countries, that of tobacco cessation websites. A published evidence based approach was used to identify one web assisted tobacco intervention (WATI) per country. Of the 195 sovereign nations' data that were accessible, the human developmental index (HDI) established by the WHO was used to determine which countries had the capacity to promote vaping cessation. The sample size was initially 57 countries but since some data were not available the final sample was 20. Of these 20 countries, 14 (70.0%) offered a national quitline and quitsite from which information on tobacco and vaping cessation resources was gathered. Only 3 countries (15.0%), offered vaping or tobacco cessation by scheduling an in-person appointment, while 6 countries (30.0%) characterized e-cigarettes as a safe and effective treatment to stop smoking combustible tobacco products when monitored by a health professional. Only one country, Denmark, offered vaping cessation resources for individuals online. The present study indicates that the dangers of vaping and information on vaping cessation are not widely observed on national websites. Given the reach and cost effectiveness of WATIs, this is an area worth further investigation.

FUNDING: Federal

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READY FOR CHANGE: SATISFACTION STUDY ON SMALLHOLDER TOBACCO FARMERS IN INDONESIA, KENYA AND ZAMBIA

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SIGNIFICANCE Smoking kills. Tobacco industry uses negative impacts of tobacco control on smallholder tobacco farmers' livelihood as an excuse to slow down, stop or reverse tobacco control efforts. There has been limited evidence in the literature on of what aspects and to what extent tobacco farmers are satisfied or unsatisfied with their current livelihood pertinent to tobacco farming. Based on a scientific measurement analysis, this study fills this void by providing a more comprehensive description of tobacco farmers' satisfaction levels and intention to continue, identifying the potential disparities of their satisfaction and intention to continue among different countries at different times, and thus aiding in explaining the underlying causes of these disparities and the insights of practical implications in an effort to encourage farmers for actions of switching. **METHODS** The data of this study come from the Tobacco Farmer Survey probing tobacco farmers' livelihood and details of the survey can be found in related studies. The data came from six groups of tobacco farmers: Indonesia 2016 ($N = 1089$), Indonesia 2017 ($N = 551$), Kenya 2016 ($N = 345$), Kenya 2017 ($N = 227$), Zambia 2016 ($N = 353$), Zambia 2017 ($N = 337$). We employed the item response theory (IRT) model using the mirt R package (Chalmers, 2012) to analyze the five satisfaction items after all the assumptions have been checked. To visually demonstrate the results, we plotted the relationships between tobacco farmers' overall satisfaction and their probability of responding to each level of satisfaction for each item in Figure 1. **RESULTS** In general, the average satisfaction level across countries at both waves were around 2.5, which suggests less satisfaction. The responses to another question, which asks about the farmers' intention to continue tobacco farming, have shown less likely intention, especially for Kenyan tobacco farmers. Taken together, Indonesian and Kenyan farmers in 2017 had higher overall satisfaction with their livelihood than 2016, while Zambian farmers of 2016 and 2017 remained the similar satisfaction level. Among farmers holding lower overall satisfaction, Kenyan farmers at both years and Indonesia farmers at 2016 felt more unsatisfied with the rating and amount they received for their tobacco, and among farmers holding higher overall satisfaction, Indonesian farmers at 2017 and Zambian



farmers at both years felt more satisfied with the rating and amount. **CONCLUSION** A significant proportion of smallholder tobacco farmers are facing different types of stress and challenges in every phase before the leaves reach to the warehouse of buyers.

FUNDING: Federal

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DISPARITIES IN HEALTHCARE QUALITY AND UTILIZATION BY SMOKING STATUS

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Significance Although cigarette smoking increases the risk of most diseases, there is evidence that people who smoke are less likely to have recommended preventive services. Relying on acute care (e.g., emergency room (ER)) or avoiding primary care visits may contribute to this disparity. We aimed to describe healthcare utilization and perception of health care quality by smoking status. **Methods** Data were analyzed from 1,726 individuals participating in a population-based cross-sectional in-person health survey of Wisconsin residents (2014-2016). Components included an in-home interview and self-administered questionnaire. Data were weighted to reflect the demographic characteristics of Wisconsin. Crude odds ratios (ORs) and adjusted ORs were calculated using multi-variable logistic regression models. **Results** Of 1,726 records analyzed, 15.3% were current-, 25.4% former- and 59.4% never-smokers. After adjusting for income, age, education, and employment, current smokers were more likely than never smokers to report the emergency room (ER) as their "usual place to go when sick" (12% vs 3%, adjOR = 1.9, p = 0.02), and visited the ER more frequently in the past year (adjOR = 1.4 vs. 0.4, p<0.0001). Independent of age, sex and insurance status, current smokers were also more likely to report their healthcare quality was poor (47% vs 29% OR 1.8, p<.001), to delay seeking healthcare services (16% vs 9% OR 1.8, p<.03), to not get care when needed (18% vs 6% OR 2.3, p<0.0001) and to report fair/poor health (28.6% vs 8.0% OR 4.8, p<0.0001). **Conclusions** Current smokers in Wisconsin are more likely to use the ER for primary care, report lower healthcare quality and more delay or avoidance in seeking care compared to never-smokers. Disparities in health outcomes among smokers may partly be due to inequitable delivery of primary care and preventive services to this high-risk group.

FUNDING: Academic Institution

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EVIDENCE FROM A SCOPING REVIEW ON USE OF E-CIGARETTES FOR SMOKING CESSATION AND TOBACCO-RELATED DISPARITIES

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Background Tobacco use disproportionately affects disadvantaged populations. It remains unclear how e-cigarettes (e-cigs) impact tobacco-related disparities. We conducted a scoping review to describe who is using e-cigs for smoking cessation. **Methods** We conducted a systematic literature search in 5 databases: PubMed, Scopus, Embase, Web of Science, and the Cochrane Library. Articles related to the use of e-cigs for smoking cessation and disparities were included for full-text review (n=19). Of those, 14 were deemed relevant for data extraction. **Results** Studies were from the US (n=10) or the UK (n=4) and published between 2013-2019. Cessation was assessed as intention/plan to quit and using e-cigs for smoking quit attempts; 4 studies reported on short-term cessation (≥30 days, up to 3 and 6 months); studies did not report on who also stopped using e-cigs; 2 qualitative studies explored reasons for using or not e-cigs for cessation highlighting the role of culture; and 2 studies assessed the role and perceptions of health practitioners in supporting cessation. Studies addressed differences across age (n=7), education (n=2), gender (n=4), race/ethnicity (n=7), SES (n=6); 12 were cross-sectional; studies did not assess the device type or if flavored e-cigs were used for cessation. Younger smokers, having a college degree, whites, and males seemed to be more likely to use e-cigs in quit attempts. Studies from the UK indicated that SES might not be a factor impeding the use of e-cigs for smoking cessation. **Discussion** These findings do not provide thorough evidence on who uses e-cigs for cessation. More research is needed to determine if/who is using e-cigs for cessation of all tobacco products, including e-cigs, and how broader social determinants of health and country-level policies might help explain differences and similarities across studies. The range of devices, flavors, and sociodemographic characteristics must be assessed in all research, including longitudinal studies. Qualitative studies can enlighten

reasons for using or not using e-cigs for smoking cessation among different groups and inform messages supporting complete cessation of all tobacco products. **Funding** This work was supported with funding from Robert Wood Johnson Foundation (rwjf.org).

FUNDING: Nonprofit grant funding entity

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ACCESS TO NICOTINE REPLACEMENT THERAPIES (NRT) FOR YOUNG ADULTS IN MONROE COUNTY, NEW YORK

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E-cigarettes are among a diverse group of tobacco products that allow users to inhale an aerosol usually containing nicotine, flavorings, and other additives. E-cigarette use (vaping) is increasing at an alarming rate in youth and young adults across the US and has been associated with adverse health risks including increased cigarette use and severe pulmonary disease. Locally, Monroe County New York falls short of NYS Prevention Agenda goals for decreased vaping rates and has labeled vaping as an emerging issue, indicating that it is important for young adults to have access to evidence-based cessation aids to avoid lifelong addiction. A previous local study highlighted a significant barrier to over-the-counter (OTC) nicotine replacement therapy (NRT) access for young adults in Monroe County. After national and state laws were passed raising minimum purchasing age of "tobacco products" from 18 to 21, many local pharmacies misinterpreted this law to limit OTC NRT sales to only adults over 21, thus limiting access to these FDA approved cessation devices. The goal of the present study was to better understand local clinical NRT practices for young adults and to mitigate any obstacles to the use of NRT for young adults who vape. Local providers and national experts were contacted via snowball recruitment to discuss NRT use for vaping in young adults. Qualitative interview data were analyzed and theme coded. Hesitation on behalf of providers regarding NRT use for young adult e-cigarette users was observed, with providers citing doubts regarding the negative health impacts of vaping and lack of information about vaping. Although there are no official guidelines for NRT use with vaping, it is important to disseminate preliminary information about NRT access and use for cessation to providers. Dissemination plans include publications in local media outlets, and regional training services.

FUNDING: Federal

P-48

TOBACCO CONTROL POLICIES AND SMOKING CESSATION TREATMENT UTILIZATION - A MODERATED MEDIATION ANALYSIS

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Background: Tobacco control policies, including clean indoor air laws and cigarette taxes, increase smoking cessation in part by stimulating the use of cessation treatments. We explored whether the mediating effect of such treatments varies across socio-demographic groups. **Methods:** We used data from 62,165 adult participants in the 2003 and 2010-2011 Current Population Survey-Tobacco Use Supplement (CPS-TUS) who reported smoking cigarettes during the past year. We used structural equation models to quantify the degree to which smoking cessation treatments (prescription medications, nicotine replacement therapy, counselling/support groups, quitlines, and internet-based resources) mediated the association between clean indoor air laws, cigarette excise taxes, and recent smoking cessation. We added selected moderators to the model to investigate whether this mediation effect varied by gender, race/ethnicity, education, income and health insurance, conservatively using a p<0.01 cutoff to assess statistical significance. **Results:** For clean indoor air laws, the mediating effect of prescription medication and nicotine replacement therapies varied significantly between racial/ethnic, age, and education groups in 2003. However, none of these moderation effects remained significant in 2010/11. For cigarette excise taxes, the mediating effect of counseling was significantly moderated by age groups in 2010/11 and the same moderator showed a trend-level significance for prescription medications. No other moderator reached statistical significance. **Conclusions:** Sociodemographic differences in how smoking cessation treatment use mediates between clean indoor air laws and smoking cessation appear to have decreased from 2003 to 2010/11. Tobacco control policies appear to impact population level smoking cessation by stimulating smoking cessation treatment use similarly across various sociodemographic groups.

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P-49

FUTURE INTENTIONS TO QUIT AND ACCESS TO CESSATION RESOURCES AMONG SMOKERS IN LOW-INCOME HOUSING

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Significance: The adoption of smoke-free housing policies can be a cessation opportunity for low-income smokers. Making high quality, low cost interventions accessible to residents in low-income settings is a critical component of smoke-free policy implementation and can help to lower smoking rates in a health disparity population. We assessed attitudes, future quit intentions and preferred cessation options among low-income residents of subsidized housing pre/post the adoption of a smoke-free housing policy. **Methods:** Adult smokers (N=61; mean age = 56; 63.6% female; 68.9% White) who were residents of 4 affordable housing properties in Pennsylvania and Virginia completed surveys approximately 6 months pre- and one month post-adoption of a smoke-free housing policy. Surveys were administered between May 2019 and August 2020. Participants were asked about their attitudes and knowledge of the smoke-free policy, readiness to quit smoking, and attitudes and use of cessation intervention options. **Results:** At baseline, 65.5% of smokers indicated that they were planning on quitting smoking, and 18.0% said that they were ready to quit now. At pre-adoption, residents reported nicotine replacement therapies (NRT) (36.1%), vaping devices (31.2%), one-on-one counseling (9.2%) as the most desirable cessation options. At 1-month post-adoption, the perceived usefulness of NRT as a cessation tool increased (44.4%, $p < 0.001$). There was no statistically significant change in perception of vaping or one-on-one counseling. Prior to the policy being implemented, 19.7% of smokers said they would vape more often after the smoke-free policy is put in place; however, in the follow-up survey, only 6.7% of respondents reported use of vaping. **Conclusion:** After adoption of a smoke-free policy, residents reported increased preference for NRT and vaping devices, with greater uptake of NRT. Implementation strategies for smoke-free housing should include a thorough needs assessment of smokers' cessation preferences, to optimize opportunities to engage low income residents with cessation interventions.

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P-50

PERCEPTIONS AND USE OF E-CIGARETTES AS A CESSATION STRATEGY AMONG SMOKERS IN LOW-INCOME HOUSING

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Significance: Smoke-free policies are increasingly being adopted in low-income housing settings, creating opportunities for cessation among a population that has historically experienced disparities in smoking rates. E-cigarettes may be a viable option to help transition from combusted tobacco use to a smoke-free environment, yet low-income groups have a lower prevalence of use of e-cigarettes. We assessed perceptions and use of e-cigarettes as a smoking cessation aid among smokers in subsidized housing prior to the adoption of a smoke-free housing policy. **Methods:** Participants (N=148) were adult smoker residents of 12 affordable housing properties in Pennsylvania, Virginia, West Virginia, Kentucky and Ohio (mean age = 52; 73.7% female; 63.3% income less than \$10,000; 77.7% White). Surveys were administered between May 2019 and May 2020. Questions focused on readiness to quit smoking, attitudes towards cessation interventions, and perceptions of e-cigarette's use as a cessation aid. **Results:** At baseline, 70.3% of smokers planned to quit smoking in the next 3 months, and 22.0% said that they were ready to quit now. 24.3% of smokers had used an e-cigarette in the past 12 months to help cut down or quit smoking. In contrast, 32.4% of smokers had tried nicotine replacement therapies (NRTs) in the past 12 months (13.5% gum; 23.7% patch; 4.7% both). Those who used e-cigarettes as a cessation aid were more likely to be White ($p = 0.050$), not retired ($p = 0.007$), and out of work ($p = 0.014$) compared to all smokers in this sample. 27.0% of smokers reported that they would find vaping e-cigarettes useful to help quit smoking, and 14.9% of smokers reported that they would use an e-cigarette more often after the smoke-free policy was put in place. In contrast, 38.5% reported NRT as a useful cessation aid. **Conclusion:** A substantial minority of smokers living in low-income affordable housing settings reported e-cigarettes as a viable strategy to comply with smoke-free rules or to quit smoking. The circumstances under which nicotine vaping products can support low-income smokers transition to a smoke-free residential environment, and the likely benefits, deserves further investigation.

FUNDING: Federal

P-51

DISPARITIES IN E-CIGARETTE/HTP USE: THE EXISTING LITERATURE AND GAPS IDENTIFIED FOR FUTURE RESEARCH

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Significance: Disparities in tobacco use increase the burden of disease among disadvantaged populations. However, evidence on how e-cigarettes (e-cigs) and heated tobacco products (HTPs) affect tobacco-related disparities is limited. This scoping review aims to identify disparities in e-cig/HTP use and determine areas for future research to advance health equity. **Methods:** A search was conducted in five databases for articles involving e-cig or HTP use and health disparities or equity. Each abstract (n=2790) was reviewed for inclusion. Articles related to disparities in the use of e-cigs/HTPs were included for full-text review (n=51). Of those, 47 were deemed relevant for data extraction. **Results:** 46 articles focused on prevalence and 1 on susceptibility. Thirty-nine of the articles were cross-sectional, 38 were conducted in the U.S., and all were published between 2014-2020. E-cig use was found to be elevated among older adolescents, younger adults, males, urban residents, and LGBT adolescents. Evidence on SES, education, and race was mixed. Only one article, conducted in Japan, reported on HTPs. One article reported on susceptibility to e-cigs among Texas adolescents. **Conclusions:** Based on our review of the literature, future studies should use longitudinal methods and consistent measures of e-cig/HTP use. Research should examine disaggregated racial and ethnic groups, if and how e-cig/HTP use progresses to other tobacco use among various populations, disparities relating to HTPs, device types used, and who is susceptible to using these products. While substantial evidence around disparities in e-cig use exists, research should move towards a health equity lens. More focus is needed on understanding the root causes of these disparities, identifying equitable solutions, evaluating policies/programs that advance health equity, and acting on these health equity ideals by creating research and funding opportunities for researchers from underrepresented groups and engaging in community-based participatory research. **Funding:** This work was supported by a grant from Robert Wood Johnson Foundation (rwjf.org).

FUNDING: Nonprofit grant funding entity

P-52

CHARACTERIZING STIGMA AGAINST INDIVIDUALS WHO SMOKE CIGARETTES IN VARIOUS HEALTH AND ECONOMIC SCENARIOS

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Significance: Stigma creates social barriers that can negatively impact treatment initiation, retention and success among cigarette smokers. Survey data were collected using Amazon Mechanical Turk (AMT), an online crowdsourcing platform, to characterize attitudes towards cigarette smokers relative to individuals with other behavior and non-behavior-based health and medical conditions who receive positive health and economic benefits. **Methods:** Participants (n=405) completed a brief screener to qualify for participation in a "Brief Health Survey" on AMT and were excluded if they were <18 years old or did not reside in the U.S. After excluding duplicate survey completers, non-completers, and participants who failed attention checks, 285 participants were included in the final analyses. Participants reviewed 45 vignettes and rated how they felt (0-10, 0=Very Upset, 5 = Neutral and 10 = Very Pleased) if a person with varying behavioral, genetic, and age-based conditions received positive health (needed organ transplant, resuscitation, ventilator for COVID treatment) and economic (COVID stimulus check, job offer) related outcomes. Medical history conditions included current cigarette smoker, bad diet, genetic health disparities, old/young age, mental illness, current treatment for substance use disorder, and recovered from alcohol use disorder. **Results:** Attitudes were the least favorable for cigarette smokers receiving health (transplant, ventilator) and economic (Stimulus check, job offer) outcomes when compared to all other medical history conditions. This effect was most pronounced when the outcome was a needed organ transplant and job offer; on average participants expressed being "upset" that cigarette smokers would receive an organ ($M = 4.6 SEM = 0.2$) or job offer ($M = 4.8 SEM = 0.3$), relative to other medical conditions, $p < .01$. **Conclusion:** These data suggest that smokers are viewed as less deserving of health and economic benefits and are potentially exposed to bias that could affect their healthcare and well-being.

FUNDING: Federal

**P-53****NIH TOBACCO RESEARCH AND THE EMERGENCE OF TOBACCO REGULATORY SCIENCE**

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SIGNIFICANCE The NIH has a long history of supporting research to prevent and control tobacco use and addiction. Following passage of the Tobacco Control Act in 2009, FDA partnered with the NIH to support research specifically intended to inform regulation of tobacco products, i.e., Tobacco Regulatory Science (TRS). Assessing how the emergence of TRS as a field of tobacco research complements the focus and support for tobacco research at NIH is one metric for evaluating the NIH-FDA collaboration's outcomes. Here we begin to address how NIH-funded tobacco research compares to the FDA-funded (NIH administered) TRS research portfolio. **METHODS** Using an internal NIH database of awarded grants, we identified NIH-funded tobacco grants and compared this to the FDA-funded TRS portfolio of all new awards in fiscal years 2015-2019. We only included NIH grant activity codes that FDA also used to support TRS. We developed a taxonomy to characterize the focus of research and the type of products investigated. **RESULTS** Between 2015 and 2019, NIH allocated approximately \$225 million towards new tobacco research (n= 563 of selected grant activity codes). FDA funded 143 new grants at about \$87 million during the same period. Fifty-eight percent of NIH grants were solicited through targeted funding opportunities in contrast to 90% of TRS grants. Much of NIH tobacco research focused on smoking combustibles (44%). In contrast, the most common products investigated in TRS grants were e-cigarettes/ENDS (62%). Most NIH (52%) and TRS (79%) grants included a focus on etiology and determinants of tobacco use, nicotine addiction and cessation. Another significant area of overlapping focus was on toxicity/health effects (35% NIH and 49% TRS). Research unique to the NIH portfolio included treatment and cessation Interventions (29%), disease pathology or progression (22%) and neurobiology (17%). **CONCLUSION** The FDA infusion of support for a new area of tobacco science appears to complement and not diminish NIH investment in tobacco research. While the scientific focus of NIH tobacco research and TRS overlaps in some areas, NIH supports a broad research agenda that extends beyond the scope of TRS.

FUNDING: Federal; State; Nonprofit grant funding entity

P-54**PRELIMINARY RESULTS FROM AN EXPERT ELICITATION ON THE EFFECTS OF A FEDERAL MENTHOL BAN ON SMOKING BEHAVIOR IN THE UNITED STATES**

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Background: The FDA issued a notice of proposed rulemaking for a federal ban on menthol cigarettes. Evidence about a ban's effects on smoking behaviors is still unclear. We conducted an expert elicitation to derive point estimates of the potential effects of a menthol ban on use behaviors. **Methods:** Eleven experts on menthol use and menthol bans were selected based on their publication record. Experts completed a questionnaire about the potential effects of three scenarios: 1) a ban on menthol cigarettes and cigars; 2) a ban on cigarettes only and 3) a ban on mint/menthol in all tobacco products. Best estimates were provided on potential ban-related changes in smoking initiation, cessation and switching to alternative products for the age groups 12-24, 18-24 and 35-54, and for the overall population and African Americans. Results from the first round of elicitation are reported as the mean of the experts' estimates. Final results will be analyzed following experts' revision of their responses. **Results:** Under a menthol ban that included cigarettes and cigars, experts expected on average that 71.1% of 12-24 year-olds who would have initiated menthol use without a ban would either not initiate (38.1%) or initiate with non-menthol cigarettes (33.0%). For 18-24 year-old current menthol smokers, 39.5% would switch to non-menthol cigarettes and 24.6% to novel nicotine delivery products (e-cigarettes or IQOS). For menthol users ages 35-54, most would switch to non-menthol cigarettes (44.8%), or quit all tobacco products (22.5%). Compared to the overall population, African American who would have otherwise initiated menthol smokers are more likely to not initiate tobacco use, and menthol cigarette users would switch to non-menthol cigarettes at lower levels in favor of increased cessation. The effects on switching to e-cigarettes and other products vary depending on the ban considered. **Conclusion:** Preliminary results from an expert elicitation found that implementation of a national menthol ban will potentially reduce initiation and increase cessation. The effects are more prominent among African Americans, suggesting that such a policy could reduce a tobacco disparity.

FUNDING: Federal

P-55**PUBLIC SUPPORT FOR PHASING OUT SALES OF CIGARETTES IN AUSTRALIA**

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Significance: As smoking rates continue to decline in some countries, including Australia, there is growing international discussion and action towards a goal once considered unthinkable: phasing out the retail sales of combustible tobacco products. Public support for a possible phase out was last measured in Australia in 2009/2010, when 72% of adults and 57% of smokers felt it would be a good thing if there was a time when cigarettes were no longer available for sale. In this study, we again examined public support for phasing out sales and for specific strategies for moving towards a phase out. **Methods:** In December 2019, we commissioned the Social Research Centre to undertake a study using its probability-based online panel, Life in Australia™. A representative sample of 1,939 Australian adults were asked six questions. Weights were applied to all analyses. **Results:** Overall, 61% of respondents thought it would be a good thing if there came a time when it was no longer legal to sell cigarettes in shops in Australia and only 17% felt it would be a bad thing. However, after the concept of a "phase out" was defined as removing a product from the market over a set period of time, such as five years, 50% indicated support for such a phase out and 62% said they thought it should happen within 10 years. Almost two-thirds (65%) agreed that retailers should think about transitioning out of selling cigarettes, 76% supported a policy requiring tobacco retailers to be licensed and 77% supported restricting sales to places that children cannot enter. Across all questions, support was stronger among never and former smokers than among current smokers. **Conclusions:** There has been little public discussion in Australia about the goal of one day phasing out the sale of cigarettes, so it is notable that such policies are reasonably well supported by the Australian public, with minority opposition. Research is required to explore barriers to support, especially among current smokers and tobacco retailers, the stakeholders who would be most directly affected.

FUNDING: Other

P-56**BEYOND SAFE AND EFFECTIVE - THE URGENT NEED FOR HIGH-IMPACT SMOKING CESSATION MEDICATIONS**

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Background A billion deaths are predicted to occur globally due to tobacco use in this century, the vast majority of which will be caused by smoking. Smoking cessation medications (SCMs), known to be safe and effective, are a pillar of tobacco control efforts. However, the extent to which SCMs can prevent these billion projected deaths is unknown. **Methods** A recent meta-analysis of the efficacy of SCMs was used to estimate the potential population impact of first-line smoking cessation medications. We assumed that population impact = efficacy*reach. We used various levels of population reach (Range: 2% -40%) and permanent cessation rates (Range: 10%-20%) to generate estimates of the potential impact of SCMs on the change in population prevalence of smoking. **Results** Using the specified estimates for reach and efficacy, we estimate SCMs can reduce the population prevalence of smoking by between 0% and 8%, suggesting no long term advantage of these interventions for approximately 92% of smokers. A scenario of low reach results in a negligible population impact at all levels of efficacy. A scenario of 15% efficacy results in reductions in population smoking rates of between 0% - 6%, depending on reach. **Conclusions** Wide dissemination of current first-line smoking cessation medications alone will have little impact on the predicted trajectory of tobacco-related mortality. Cessation methods that support permanent cessation for a majority of smokers, and which are widely accessible, are urgently needed to complement other tobacco control strategies in order to avert a global tragedy in the coming decades.

FUNDING: Academic Institution



P-57

MENTHOL CIGARETTES ARE MORE APPEALING AND REWARDING FOR YOUNG ADULT SMOKERS THAN NON-MENTHOL CIGARETTES: AFFIRMING THE ABUSE LIABILITY AND ADDICTION POTENTIAL OF MENTHOL

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Significance: Menthol cigarettes are popular among young adults and are disproportionately used by Black smokers. Menthol's minty and cooling sensation in the throat and mouth have been hypothesized to enhance the appeal and reinforcement of smoking. This study examined differences in subjective appeal for smoking menthol versus non-menthol cigarettes across Black and White young adult (ages 18 to 24) smokers. **Methods:** Participants were recruited from Amazon Mechanical Turk and completed a survey on tobacco use behavior; past year smokers answered questions about subjective response to smoking (psychological reward, satisfaction, throat hit, craving reduction, and aversion). **Results:** The analytic sample was $n = 1,856$ Black and White ever smokers who reported a preference for either menthol (32.6%) or non-menthol cigarettes (25.8%). Significantly more Black (68.7%) vs White (45.5%) smokers initiated smoking with a menthol cigarette (p less than .001). ANOVA tests examined the main and interactive effects of menthol preference and race (Black vs White) on the five indices of subjective appeal. Significant mentholXrace interactions emerged (all p 's less than .01). Specifically, Black menthol smokers rated smoking as significantly more rewarding, satisfying, pleasant in the mouth/throat, and craving-reducing than all other groups (e.g., Black non-menthol smokers, White menthol and non-menthol smokers). Menthol preference and all indices of subjective appeal were positively correlated with lower harm perceptions of smoking. **Conclusions:** The relationship between menthol preference and subjective response to smoking differed by race, a potential mechanism underlying disparities in menthol use. Findings also further support the addiction potential of menthol cigarettes, as evidenced by the positive association between subjective appeal and lower perceptions of harm. Policies that ban menthol cigarettes may have a particularly positive impact on the public health of Black young adult smokers.

FUNDING: Federal

P-58

KNOWLEDGE, ATTITUDES AND EXPERIENCES WITH TOBACCO-FREE UNIVERSITY POLICIES AMONG TOBACCO-USING EMPLOYEES AND STUDENTS

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Significance: Though university smoke- and tobacco-free campus policies have been proliferating across the country, compliance and enforcement remain challenges. In order to better protect university communities from secondhand smoke, the purpose of this study was to examine perceptions of campus tobacco-free policies and rationale for non-compliance among employees and students who report using tobacco products on campus. **Methods:** From October 2019 to February 2020, employees and students who self-reported using tobacco products on campus were recruited from two tobacco-free 4-year public universities in Southern California to participate in focus group discussions on campus smoking policies. After focus group recordings were transcribed, a phenomenological analysis was conducted after structured coding and subcoding of focus group data. **Results:** Fifteen employees and 53 students participated in focus group discussions with 57.4% ($n=39$) male. Almost half of participants (45.6%) were polytobacco users (cigarettes, e-cigarettes, and alternative tobacco products), with 25% e-cigarette only users, and 11.8% cigarette only users. Only 7.2% of participants correctly identified the university tobacco-use policy, with 82.6% reporting their campus as smoke-free. The most common channel for learning of the campus tobacco use policy was through signage. Participants cite a wide array of outdoor locations where they used tobacco products, but also report indoor locations where they used products, including bathrooms, during class, libraries, laboratories, and private offices. They mainly justified non-compliance by stating they were not harming or bothering others, and the three main considerations for tobacco product use reflect this: doing so away from others, out of sight of others, and out of respect for others. Participants reported limited enforcement of campus policies, but suggested that aggressive enforcement by non-authoritative figures decreased desire to comply with tobacco-free policies. **Conclusions:** Improved compliance with university tobacco-free policies will require greater awareness through more varied and effective education. Universities

must clearly articulate the scope and intent of tobacco policies through active, targeted engagement with campus subpopulations. Campaigns may appeal to inherent interest in minimizing harm to others.

FUNDING: State

P-59

MENTHOL E-CIGARETTE SALES RISE FOLLOWING 2020 FDA GUIDANCE

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Significance: The recent dramatic increase in US youth initiation of e-cigarettes has been associated with appealing sweet and fruity flavors that have dominated the market. Citing concerns about youth e-cigarette use, Juul Labs halted in-store sales of fruit- and sweet-flavored products in November 2018, a decision that was followed by a surge in mint- and non-Juul fruit-flavored e-cigarette sales. In November 2019, Juul Labs removed mint-flavored products and in January 2020, the Food and Drug Administration (FDA) released e-cigarette flavor guidance prohibiting flavored cartridge-based sales but allowing the sale of tobacco- and menthol-flavored cartridges, open-systems, and disposable e-cigarettes. Little is known about the patterns in flavored e-cigarette sales following these 2019 Juul Labs and 2020 FDA actions. **Methods:** We analyzed Nielsen Retail Scanner Data from October 2013 through March 2020. Inflation-adjusted sales dollars for e-liquid-containing products were classified into five flavor categories (fruit, menthol, mint, tobacco, and other). **Results:** Following the Juul Labs 2019 and FDA 2020 actions, total e-cigarette sales declined; however, menthol-flavored e-cigarette sales dollars increased, while mint-flavored e-cigarette sales dollars decreased in both instances. Juul Labs' removal of mint-flavored products was followed by the market share of mint-flavored e-cigarettes decreasing by 38.5% and the share of menthol-flavored e-cigarettes increasing by 59.4% over 4 weeks. After 8 weeks, the market share of mint-flavored e-cigarettes decreased by 72.0% and the share of menthol-flavored e-cigarettes increased by 127.5%. The FDA's 2020 guidance was followed by the market share of mint-flavored e-cigarettes decreasing by 62.4% and the share of menthol-flavored e-cigarettes increasing by 43.6% over 4 weeks. After 8 weeks, the market share of mint-flavored e-cigarettes had decreased by 87.4% and the market share of menthol-flavored e-cigarettes increased by 67.3%. **Conclusion:** Juul Labs' self-regulation and the current FDA flavor guidance were followed by a shift toward menthol-flavored e-cigarettes. Given the much higher prevalence of youth e-cigarette use compared with adult use, industry self-regulation and current federal guidance appear insufficient in reversing the youth vaping epidemic. E-cigarettes must be fully regulated as a tobacco product including the removal of flavored e-cigarettes, including menthol, from the market to reduce youth e-cigarette use.

FUNDING: Other

P-60

ASSOCIATIONS BETWEEN STATE-LEVEL TOBACCO POLICIES AND E-CIGARETTE AND CIGARETTE USE AMONG YOUTH IN THE UNITED STATES: EVIDENCE FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance: In recent years, e-cigarettes have become the most used tobacco products among both middle and high school students in the US. In this study, we examine the associations between state-level tobacco policies including age restrictions for e-cigarette purchase, cigarette tax, and smoke-free air laws and e-cigarette/cigarette use among youths in the United States (US). **Methods:** Using the Population Assessment of Tobacco and Health (PATH) Study Wave 1 (2013-2014) & Wave 2 (2014-2015), we utilized logistic regressions to capture these associations among youths in the US. All regressions were controlled for youths' demographic characteristics such as age, gender, race, and ethnicity. **Results:** At wave 1, unlagged age restrictions for e-cigarette purchase were not significantly associated with youths' e-cigarette use. Youths who live in states with age restrictions had lower odds of ever cigarette use, and being current cigarette use. At wave 2, lagged age restrictions were negatively associated with youths' ever cigarette use, but were not significantly associated with youths' new/current e-cigarette/cigarette use. Youths' demographic characteristics (age, gender, race) were significantly associated with youths' e-cigarette/cigarette use. Youths who



live in states with higher population covered by 100% smoke-free workplace air laws had higher odds of being current e-cigarette users. **Conclusion:** We document no significant associations between age restrictions for e-cigarette purchase and youths' e-cigarette use. Higher state per-pack cigarette tax was significantly associated with youths' lower odds of cigarette use. Youths may use e-cigarettes as an alternative to smoke in places where smoking is banned.

FUNDING: Federal; Academic Institution

P-61

ASSESSING COMPLIANCE OF ONLINE VAPING SHOPS TO THE 2019 MASSACHUSETTS PRODUCT SALES BAN

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Introduction: Recent reports of lung injury associated with ENDS products have led to a patchwork of legislation that restricts the marketing, sale, distribution, and accessibility to different types of vaping products. This includes public policy seeking to enact strict ENDS product sales bans in both the physical and digital retail space. **Objective:** This study characterizes the different approaches to ENDS sales ban legislation and also assess if these policies are being complied with by online ENDS vendors. **Methods:** We first characterized ENDS products sales ban legislation by reviewing state and local policies on the database Legiscan and as reported in the news. Once characterized we conducted further examination of policies that explicitly restricted online ENDS sales. The case study of Massachusetts' was selected to examine compliance to a ENDS sales ban. To determine adherence to the state's sales ban requirement, we conducted structured web surveillance and content analysis of online vendors. **Results:** Massachusetts was the only state to implement a restriction via Executive Order on ENDS product sales for both physical and online stores. We examined fifty vaping shops and conducted simulated online purchases in November 2019. This yielded 72% (n=36) stores that were non-compliant and allowed placement of ENDS products orders without restrictions to a Massachusetts address. 61% (n=22) of non-compliant stores were located in the USA and 39% (n=14) were located in Canada. Other characteristics of interests, including the use or absence of age verification, location data, and web registrar/registrant data also analyzed. **Conclusion:** The Massachusetts executive order allowed for an investigation into the impact of a complete ban on all ENDS products to MA users via online sellers. We found that the majority of online shops reviewed were non-compliant. Future studies should identify specific challenges associated with implementation of tobacco control policies in the context of online ENDS vendors compared to traditional brick-and-mortar and retail establishments.

FUNDING: State

P-62

AVAILABILITY AND MARKETING OF E-CIGARETTES POST-LEGALIZATION IN ONTARIO

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Significance: The availability and marketing of e-cigarettes in Ontario, Canada was limited prior to the enactment of the Tobacco and Vaping Products Act in 2018 (May). Through a qualitative study we sought to explore the changes in availability and marketing of these products since the enactment of the 2018 legislation. **Methods:** In July 2019, we conducted 33 semi-structured store interviews across 5 Ontario cities. Observations were made in four store types: convenience stores (gas stations, chain, and independent)(CS), head shops (HS), tobacconists (T), and vape shops (VS). **Results:** Several vape store and CS staff reported that tobacco companies were incentivizing stores to advertise and carry their pod type devices. Incentives included receiving a financial reward for each product sold or advertised, contests and vacation giveaways. VS tended to avoid advertising and carrying products from tobacco companies, whereas all CGS advertised and carried these products. Interview findings from T and HS varied and seemed independent and based on a store's own decision). HS, T, and VS staff reported that they felt restricted by the legislative changes and have had to rely on word of mouth to generate sales whereas CS staff stated that they felt advertisements on the store's interior/exterior translated to an increase in product sales. Although all store types described a variety of customers, there were more CS who reported youth/young adults and previous non-smokers purchasing e-cigarettes compared to the three other store types. Nearly all store staff expressed confusion and concern around the legislation, specifically on what they were allowed/not allowed to do. In response, VS and HS staff reported erring on the side of caution, whereas CS staff reported proceeding as is until otherwise noticed. Staff from VS, and HS reported being heavily scrutinized

for compliance by public health departments, a view not shared by T and CS staff. **Conclusions:** Since legalization, store staff have reported an increased advertising push from tobacco companies including the use of incentives directed toward carrying and advertising their products. Some stores indicated that advertising translated to sales, especially among young adults and previous non-smokers, whereas other stores expressed being hindered by the legislative change. There was a clear difference in how the legislation affected stores based on store type. Findings have the potential to help inform policy decisions on future e-cigarette regulations.

FUNDING: State

P-63

CHARACTERIZATION OF ENDS INDUSTRY COORDINATION AND INFLUENCE ON CA TOBACCO CONTROL POLICY ON FACEBOOK

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Background: The growing popularity of emerging and alternative tobacco products has coincided with a need for strengthening tobacco control policy. In response, the ENDS industry has taken actions to mobilize against public health measures, including engaging in digital coordination on popular social media platforms. **Objective:** This study identified, analyzed, and characterized pro-tobacco social media posts from California ENDS industry trade associations on Facebook in order to characterize opposition to state and local tobacco control policy. **Methods:** An automated web scraper collected public posts on Facebook public group pages created by the California Consumer Advocates for Smoke Free Alternatives Association and the official community page of the Northern California Chapter of SFATA. We then manually annotated posts, and selected posts associated with policy mobilization and advocacy against tobacco control activities. We also assessed interaction between users. **Results:** We collected 288 Facebook posts from the Northern California Chapter of SFATA and 411 posts from the California Consumer Advocates for Smoke Free Alternatives Association. A total of 554 personal accounts were active as page followers, public group members or page admins and Moderators. Based on our content analysis, we identified 3 different categories of policy mobilization related posts: (1) event invitations for users to actively participate in pro-tobacco advocacy events; (2) commentary posts on CA tobacco control policy, including misrepresenting facts about policy; and (3) positive messages about ENDS products benefiting users. In addition, we observed misinformation related to ENDS product and policy posts in community pages. **Conclusion:** California is at the forefront of tobacco control and ENDS legislation. However, this activity has also mobilized pro-tobacco social media communities on Facebook, driven by strategic activities of trade associations and their members. These digital communities are focal points for misinformation, grass-roots mobilization, and industry coordination to thwart future tobacco control policy that needs further exploration.

FUNDING: State

P-64

MENTHOL PLUS. A MAJOR CATEGORY OF CIGARETTE FOUND AMONG CONCEPT DESCRIPTOR CIGARETTES FROM MEXICO AND CANADA

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Significance: Global tobacco companies are offering cigarettes with "concept descriptor" names that suggest flavor/sensation properties (e.g., Marlboro "Velvet Fusion"). Little is known about the identities and levels of flavor chemicals in such cigarettes. **Methods:** 33 filter cigarette variants from 27 packs (including two "sampler packs" with four variations each) from Canada and Mexico were analyzed (rod+filter) for 177 flavor chemicals plus triacetin, a filter plasticizer and possible flavorant. Five brands of U.S. mentholated filter cigarettes were also analyzed. **Results:** 27 of the 33 cigarette variants (all of the variants from Mexico and 2 of the 8 variants from Canada) were categorized as "menthol-plus": significant menthol (3.0 to 11.9 mg/cigarette), plus varying amounts (0.32 to 3.4 mg/cigarette) of TOFCs (total other flavor chemicals, excludes triacetin). For 10 of the 27, TOFCs>1.0 mg/cigarette. For 14 of the 27, the TOFCs profile was categorized as containing total fruit flavor compounds (TFFCs)>1.0 mg/cigarette. One of the 33 cigarette variants (from Canada) was categorized as "menthol-only" (TOFCs≤0.15 mg/cigarette). All of the "menthol-plus" and "menthol-only" cigarettes contained one or two optional-crush capsules in their filters (crushed here prior to analysis). Five of the cigarettes were categorized as "non-flavored". All five U.S brands were "menthol-only". **Conclusion:** All of the "concept descriptor" cigarettes from Mexico were "menthol-plus".



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Canada bans flavors in cigarettes, including menthol; 2 of the 8 cigarette variants from Canada were "menthol-plus" and 1 was "menthol-only", which do not comply with Canadian law. Given the scale of the problem posed by menthol alone, health officials seeking to decrease the appeal of smoked tobacco should examine the extent to which "concept descriptor" cigarettes using "menthol-plus" flavor profiling together with artful product names are furthering the problem of smoked tobacco.

FUNDING: Other

P-65

WHY WE CANNOT AFFORD TO FORGET ABOUT CIGARS

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Significance: Current cigar use (7.6%) among U.S. high school students exceeds rates of current cigarette use (5.8%), according to the 2019 National Youth Tobacco Survey. Further, 43.2% of current high school tobacco product users report smoking flavored cigars. The Food and Drug Administration began regulating cigars in May 2016, but has not put forth policies to reduce the use of these products among youth. Since cigars have only been regulated recently, an updated review of the science is necessary for policymakers to better understand the issues surrounding these products. **Methods:** This study consisted of a systematic review via a PubMed search of all scientific literature on cigars published after the 1998 National Cancer Institute's Tobacco Control Monograph 9, Cigars: Health Effects and Trends. **Results:** Since 2000, cigarette consumption rates in the U.S. have declined 38.7% while consumption rates of cigars have increased dramatically (85.2%), undermining the progress made in reducing cigarette use. Further, prevalence of little cigar and cigarillo use is likely underestimated due to misreporting in surveys. Consumers believe cigar smoking to be less harmful and more socially acceptable than cigarette smoking. Cigar smokers are likely to experiment or be current users of other tobacco products and marijuana. The cigar market is heavily flavored and flavored cigar use is especially high among youth. Tobacco industry advertising and promotional activities of cigar products is associated with youth and young adult smoking initiation. Moreover, the federal cigar tax disparity allows cigar manufacturers to manipulate the weight of their products and avoid regulation. **Conclusion:** While the prevalence of cigarette use has decreased in the United States, the tobacco control community and the Food and Drug Administration should be concerned about cigar use, especially among youth, and work on policies to address the use of these products, including addressing flavors in cigar products.

FUNDING: Other

P-66

E-CIGARETTE AND CIGARETTE USE PATTERNS AND PURCHASING BEHAVIORS AMONG CIGARETTE SMOKERS DURING A STATEWIDE E-CIGARETTE BAN

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Significance: Following the 2019 U.S. outbreak of lung injury cases associated with e-cigarettes, Massachusetts banned sale of all vaping products for 3 months (9/25/19-12/11/19), after which a state law banned flavored e-cigarette sales only. We assessed attitudes and behaviors related to e-cigarette and cigarette use among adult cigarette smokers following MA's total ban on e-cigarette sales. **Methods:** We identified cigarette smokers aged 40-80 years receiving primary care at MA General Hospital in the electronic health record. A phone survey done 11/07/19 to 2/27/2020 asked about cigarette and e-cigarette use behavior changes and e-cigarette purchasing patterns during the e-cigarette sales ban. **Results:** We surveyed 284 adults (mean age 58 years, 54% female, 85% white, 56% with some college education). 8% of participants currently used e-cigarettes, 51% were former users, and 42% were never users. Among the 23 participants who reported using both cigarettes and nicotine e-cigarettes around the start of the total ban on e-cigarette sales, 57% either quit or cut down on e-cigarette use because of the ban. In contrast, only 30% of participants reported changing cigarette consumption during the ban. 5 of the 6 participants who increased their cigarette smoking had either quit or reduced vaping because of the ban, suggesting that 5 of 13 participants (38%) who reduced e-cigarette use because of the ban may have increased cigarette smoking in compensation. 80% of e-cigarette users purchased e-cigarettes during the ban, while 20% obtained them from non-commercial sources. About half of those who purchased e-cigarettes reported purchasing them in MA or online, actions that appeared to violate the ban. The remainder purchased e-cigarettes out-of-state. **Conclusions:** The total ban on e-cigarettes sales in MA, prompted by EVALI cases, had some success in reducing access to and use of e-cigarettes. However, the ban was circumvented by a

number of individuals purchasing the products illegally in-state or online and by those purchasing products legally out-of-state. These findings illustrate the challenges faced by policymakers trying to stop access to addictive products.

FUNDING: Federal

P-67

POLICY COMPLIANCE OF TOBACCO CONTROL LAWS AT POINT OF SALE AND PUBLIC PLACES IN INDIA

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Point-of-sale (POS) tobacco product marketing is associated with increased susceptibility to tobacco use and increased purchases by existing users. The Cigarettes and Other Tobacco Products Act (COTPA) in India regulates tobacco sales and promotion at the POS and public places. Policy implementation however, has been a challenge, particularly for achieving compliance in specific settings. We conducted a cross-sectional survey in 52 neighborhoods of Mumbai and Kolkata, India in 2019. Geographic Information System (GIS) data was collected using ArcGIS Collector. Within each neighborhood, we randomly sampled up to 20% of tobacco vendors (pan bidi kiosk, general store, tea shop, street vendors, supermarket, small grocery store tobacco specialist and mobile vendors) and enclosed public places (restaurants, bars, hospitals, educational institutions and semi-open public place, bus stops) for compliance checks. Compliance measurements were done at 1229 tobacco vendors (650 in Mumbai; 579 in Kolkata) and 937 public places (546 in Mumbai; 391 in Kolkata). Compliance measurements at tobacco vendors included advertisements, signage indicating no sale to minors, and location within 100 yards of an educational institution; while those at public places included presence of ashtrays, no smoking signs at specified locations, and smoking. In Mumbai and Kolkata, >99% tobacco vendors and public places were found to be non-compliant to at least one of the compliance measures. Among the mapped vendors, 88% of vendors in Mumbai and 83% in Kolkata had tobacco products placed near candies or snacky foods. Of the sampled public places, 91% were non-compliant for displaying "no smoking" signs in each city. Significant differences were observed (p<0.01) in policy compliance within educational institutions, where only 12% of mapped educational institutions in Mumbai versus 55% in Kolkata had signage prohibiting tobacco vendors from being present within 100 yards of their campus. Compliance with tobacco control laws at the POS and public places is extremely low. Future research should focus on compliance surveillance and identifying evidence-based strategies to increase compliance in India.

FUNDING: Federal

P-68

TRENDS IN THE NUMBER AND TYPE OF U.S. TOBACCO RETAILERS, 2000-2017

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Background: The availability of tobacco retailers may influence smoking behavior through tobacco marketing and accessibility. There is no national licensing system for tobacco retailers, making it difficult to analyze the changes in the number and composition of tobacco retailers over time. This study identified annual measures of the number and type of tobacco retailers in the U.S. between 2000-2017, as well as new tobacco retailers established annually and retailers that go out of business or stop selling tobacco. **Methods:** We identified likely tobacco retailers across the U.S. based on store types and retailer names using the annual National Establishment Time Series (NETS) database between 2000-2017. We included all retailers in store-type categories where tobacco selling occurs frequently, then added or removed additional retailers who are known to sell or not sell tobacco products, or who are prohibited from selling by legislated policy. We calculated annual counts of tobacco retailers by store type and the number of retailers that started or stopped selling tobacco each year. **Results:** The number of likely tobacco retailers grew by 30% from 317,492 in 2000 to 412,536 in 2009, followed by a 14% drop over the next eight years to 356,074 in 2017, resulting in a net 12% increase over the full time period. Trends varied by store type, with overall reductions in gas/convenience stores and tobacco selling pharmacies, but much larger increases in tobacco-selling discount stores. Fluctuations within the market were also noticeable with an average 7-8% of retailers entering or exiting the market each year. **Discussion:** Despite market volatility following the Great Recession, and recent downward trends, there were more tobacco retailers in 2017 than in 2000. Legislated and voluntary bans



on pharmacy sales have reduced the numbers of pharmacies that sell tobacco. Yet the growth of discount stores, combined with the decision by some to begin selling tobacco resulted in more tobacco retailers in this store type.

FUNDING: Federal

P-69

CHARACTERIZING USE OF E-CIGARETTES IN A RANDOMIZED CLINICAL TRIAL INVESTIGATING REDUCED NICOTINE CONTENT CIGARETTES AMONG SMOKERS WITH PSYCHIATRIC CONDITIONS OR SOCIOECONOMIC DISADVANTAGE

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Significance: Studies examining the effects of very low nicotine content cigarettes (VLNCs) have demonstrated that reductions in nicotine content decrease smoking rate and dependence severity among general and vulnerable populations. However, reducing the nicotine content of cigarettes may lead smokers to seek other sources of nicotine to compensate. The aim of this study is to examine associations between e-cigarette use and the effect of VLNCs on total cigarettes smoked per day (CPD) among vulnerable populations. **Method:** This is a secondary analysis of a 12-week, double blind, randomized clinical trial evaluating the effects of VLNCs among individuals (n=775) from three vulnerable populations: smokers with affective disorders (n=258), opioid use disorder (OUD; n=260), or socioeconomically disadvantaged women (n=257). Participants were assigned to smoke one of three research cigarettes (15.8, 2.4, 0.4 mg of nicotine/g of tobacco). Participants reported CPD and daily use of e-cigarettes via an interactive voice response system for the duration of the study. Total CPD was the primary outcome in the parent trial. Outcomes were analyzed using repeated measures analysis of variance with alpha at p<.05. **Results:** Use of e-cigarettes was reported by a subset of smokers in all populations but the only significant effect observed was an interaction with population and cigarette nicotine content (F[4,758]=3.30, p=0.01) wherein smokers with OUD assigned to 15.8 mg/g were more likely to report use of e-cigarettes than those assigned to 2.4 mg/g and 0.4 mg/g (Ps<.001). Differences in e-cigarette use by assigned cigarette nicotine content were not observed among smokers with affective disorders or socioeconomically disadvantaged women. We saw no significant main effect of e-cigarette use (F[1,252]=0.06, p=0.81) nor interaction of use with cigarette nicotine content (F[2,7413]=1.95, p=0.14) on total CPD. **Conclusion:** We found no evidence that e-cigarette use moderated the effect of VLNCs on reducing total CPD among these vulnerable populations.

FUNDING: Federal

P-70

VAPING AT WORK - PREVALENCE, PERCEPTIONS AND E-CIGARETTE-FREE WORKPLACE SUPPORT

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Indoor smoke-free air laws have been a major public health success. Not only have they improved the health of non-smokers by reducing their exposure to dangerous second-hand smoke, they encourage smokers to quit, discourage smoking initiation, and reduce consumption of combustible tobacco products. Unfortunately, these laws don't always include the use of e-cigarettes. The objective of this study was to describe the prevalence of vaping in US workplaces, perceptions that employees have about vaping at work, and support for vape-free workplace policies. Participants (N=1607), ages 18-65, were recruited in November 2019 to a web-based survey using Qualtrics Online Sample. Participants were U.S. residents who worked full-time in a setting that was not primarily located in their home at a company with at least 150 employees. The majority of participants, 61.6%, reported having seen a coworker vape at work. The majority (76.0%) of current e-cigarette users reported having vaped at work (19.1%). Most participants perceived workplace vaping as harmful, with an average perceived harm score of 1.94 (SD=0.87) out of 3. Participants also reported that workplace vaping bothered them (63%) and that it decreased productivity for those who didn't vape

(52.1%). A majority of respondents supported vape-free workplace policies (73.5%), including majorities of current (53.5%), former (70.8%) and never (82.8%) vapers. Multivariable models revealed that seeing coworkers vape was associated with vape status, workplace characteristics and respondent demographics, while perceptions of workplace vaping and vape status were significant predictors of support for vape-free policies. These results reveal that, while vaping at work is common, the majority of employees have negative perceptions of workplace vaping and support vape-free workplace policies. Vape-free workplaces are an important part of supporting health and wellness. Employers should adopt and implement these policies knowing that there are high levels of support among employees to do so.

FUNDING: Other

P-71

YOUTH AND YOUNG ADULT ACCESS TO VAPE DEVICES AND REFILLS AMID CHANGES IN POLICY AND ACCESS

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The dramatic increased prevalence in vape use among youth and young adults has been attributed largely to pod based devices and flavored vape juice appealing to young people. However, 3 recent events may have limited access to these products for youth and young adults: 1) December 20, 2019 a Tobacco-21 law made it illegal for anyone under the age of 21 to purchase tobacco or nicotine products; 2) February 6, 2020 restrictions on flavored pod-based e-cigarettes went into effect; 3) March 17 2020, COVID-19 resulted in 'Stay at Home' orders in many states. Given these restrictions, identifying if and how young people continue to gain access despite barriers or restrictions can inform prevention efforts. Utilizing data from a national continuous tracking survey, conducted among 220 youth and young adults (aged 15-24) per week between December 2019 and July 2020, truth was able to examine data specific to these policy/access change time periods. Past 30-day vapers identified where they got their most recently used device and pod/liquid refill. A social source included friend, family or some other person. A retail source included vape shop, stores, the mall or online. Among youth aged 15-20, past 30 day vape use dropped dramatically between December (23%) and July (9%) but use did not significantly change for young adults age 21-24 during that time (23% in December vs 27% in July). Youth vapers (15-20) rely on social sources more than retail sources for both their devices and their refills, and when barriers to access increased, so did continued reliance on social sources. Use of social sources increased from December (51% for devices and 46% for refills) to July (61% for devices and 53% for refills). In contrast, more young adult vapers (21-24) used retail sources (61% for their device and 70% for their refills in December) and this remained constant throughout the spring. More work is needed to isolate the separate effects of age, flavor and other restrictions to access. These results provide preliminary evidence that restrictions can be effective at decreasing youth access and therefore prevalence of vape use among young people and may compliment education efforts.

FUNDING: Other

P-72

REAL-WORLD VAPING EXPERIENCES AND SMOKING CESSATION AMONG CIGARETTE SMOKING ADULTS

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Significance: E-cigarettes may have the potential to be an effective cessation aid for some cigarette smokers. However, the extent to which smokers' experiences using e-cigarettes (vaping) to quit smoking impact their cessation outcomes is unclear. In this cross-sectional survey study, we develop a multidimensional measure of vaping experiences in adults who quit smoking by vaping and test its association with perceived success in smoking cessation. **Methods:** In 2019, recruitment invitations were emailed to adult past-year smokers who had accessed cessation services across Ontario, Canada. Respondents who tried vaping to quit smoking in the past year completed a detailed online survey. Factor analysis was performed on ratings of 45 vaping experiences items to identify dimensions of vaping experiences. Factor scores were entered into logistic regressions to test if vaping experiences dimensions had differential impact on perceived success in smoking cessation. **Results:** Of the 889 participants, 56.0% were female, 81.1% were Caucasian, and the mean age was 37.7 (standard deviation, 11.9) years. Twenty percent (19.6%) reported having successfully quit smoking by vaping



in the past year. Among the six vaping experiences factors, better experiences in five factors—Relationships, Flexibility of Vaping, Side Effects, Vaping Devices, and Sensory Functions—were each independently and positively associated with improved odds of successful quitting. Notably, Relationships (odds ratio, 2.01, 95% CI, 1.61 to 2.64) and Side Effects (odds ratio, 1.95; 95% CI, 1.54 to 2.29) were the strongest correlates of perceived success in smoking cessation. **Conclusion:** These findings indicate an opportunity to increase cessation rates by improving the experiences of smokers who vape to quit smoking.

FUNDING: Nonprofit grant funding entity

P-73

REAL-TIME SURVEILLANCE OF E-CIGARETTE DEVICE TRENDS AMONG TEENS AND YOUNG ADULTS

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Introduction: In fall 2019, JUUL suspended the sale of fruit flavors and mint. In February 2020, the FDA implemented a partial ban on pre-filled flavored pods excluding menthol and tobacco. National tobacco use surveillance among young people conducted annually may miss opportunities to evaluate the impact of such market changes and policies. This study examined changes in e-cigarette brand use reported by n=126,887 teens and young adults enrolled in a quit vaping text message program during the time these changes occurred. **Methods:** When enrolling in the text message program, users were asked which e-cigarette device they use; response options were JUUL, Vuse, Suorin or "Other". In January 2020, a subset of users (n=8,158) who reported "Other" were asked to name their specific device. 28.4% (n=2,318) responded and their responses were coded by the research team. **Results:** Between July 2019 and May 2020, n=126,887 users responded to the device question (98.7% of enrollees). JUUL use was reported by 75% of users in July 2019; by May 2020, it had dropped to 40%. Trend analysis showed marked reductions in Oct 2019 (61%) and Feb 2020 (45%). Simultaneously, use of "Other" device types was reported by 18% of users in July 2019, which increased to 50% by May 2020. Among the subset who responded "Other", disposables were the most common category of device (42%), with Puff Bars, Stig and Posh the top 3 disposable brands. **Discussion:** The decrease in JUUL use among enrollees of a quit vaping text message program correlated with both the suspension of flavor sales by JUUL, as well as the policy ban on pre-filled flavored pods by the FDA. Increase in the use of "Other" devices showed the emergence of new products that did not fall under the new regulations of the FDA. Product types are rapidly changing, especially in light of policy changes and removal of products from the market. The removal of certain brands or delivery methods open loopholes to new products and devices that evade the regulations created by the FDA. Continued monitoring of device data is important for both surveillance and regulatory decisions.

FUNDING: Nonprofit grant funding entity

P-74

SMOKELESS TOBACCO BAN, A SUPPORT FOR COVID-19 CONTROL - A DUAL PUBLIC HEALTH ACTION

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Significance: This policy brief revisits tobacco control policy in India, provides an evaluation of the implemented regulations, and identifies gaps that when addressed could reinforce the efforts of ongoing tobacco control in India. **Methods:** Systematic review of published literature, Government reports with tobacco control and public health policies. **Results:** India, the second-largest tobacco consuming country with 60% of the tobacco consumed in the form of smokeless tobacco, by all genders and age groups, as there is no social stigma, as associated with smoking. Chewing or holding tobacco as a dip produces copious amounts of saliva with a strong urge to spit sporadically. Thus in the current situation of Covid-19 pandemic, use of smokeless tobacco imposes a greater threat. Lack of sustainability in maintaining the rule of lockdown and home quarantine, along with spitting the tobacco extract in public places naturally exacerbates the spread of infection, given the known transmission route. The Government of India, in coordination with state Governments, has banned sale of tobacco. Although India has been a party to the WHO-FCTC since 2004, there were no such drastic steps taken previously despite of the GATS 1 and 2 surveys reporting higher consumption rates. **Conclusion:** Lack of wider cessation support potentially undermines the ban, as the neurobiology of nicotine addiction may potentially not support drastic measure.

FUNDING: Unfunded; Academic Institution

P-75

USE MACHINE LEARNING TO IDENTIFY CORRELATES OF PERCEIVED SUCCESS IN QUITTING SMOKING BY VAPING

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Significance: Prior research has suggested that a set of unique characteristics may be associated with adult cigarette smokers who are able to quit smoking using e-cigarettes (vaping). In this study, we aimed to identify and rank the importance of these characteristics using machine learning. **Methods:** This cross-sectional survey study is based in Ontario, Canada. During July and August 2019, an online survey was administered to a convenience sample of 889 adult smokers (aged 20 or above) who tried vaping to quit smoking in the past 12 months. Fifty-one person-level characteristics, including a Vaping Experiences Score, were assessed in a gradient boosting machine model to classify the status of perceived success in vaping-assisted smoking cessation. This model was trained using cross-validation and tested using the receiver operating characteristic (ROC) curve. The top five most important correlates were identified using a score between 0% and 100% that represented the relative importance of each variable in model training. **Results:** About 20% of participants (N=174, 19.6%) reported success in vaping-assisted smoking cessation. The model achieved relatively high performance with an area under the ROC curve of 0.865 and classification accuracy of 0.831 (95% CI, 0.780 to 0.874). The top five most important correlates of perceived success in vaping-assisted smoking cessation were the Vaping Experiences Score (100%), number of quit attempts by vaping (39.0%), age (21.9%), having vaped 100 times (16.8%), and time after waking up to vape (15.8%). **Conclusion:** Our findings provide strong statistical evidence that shows better vaping experiences improve the rate of perceived success in smoking cessation by vaping. Furthermore, our study confirmed the strength of machine learning techniques in vaping-related outcomes research based on observational data.

FUNDING: Nonprofit grant funding entity

P-76

PERCEIVED CAUSE OF ROBBERIES FOR TOBACCO IN NEW ZEALAND. CONTENT ANALYSIS OF MEDIA COVERAGE 2008 TO 2019

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Significance: Robberies of convenience stores for tobacco increased dramatically in New Zealand over 2015-2017. Many robberies were aggravated involving the use of weapons. Over 100 people were reportedly injured according to media reports. Community and retailer alarm attracted a lot of media attention and debate as to the potential causes. Historic repeated increases in the excise tax on tobacco had raised the price of tobacco to the highest in the world relative to income. But government and academic commentators denied that the tax hikes were in anyway associated with the robberies. **Methods:** Content analysis of all online media articles published during 2008-2019 was conducted to identify attitudes towards and opinions on the causes of the tobacco robberies, introduced and proposed remedies. **Results:** Commentators' represented a wide range of stakeholders including retailers, civilians, police, politicians, crime prevention professionals and tobacco control advocates. Consumers were under-represented. The most frequently perceived cause of the robberies was high tax. The main concerns were violence towards shop owners and limited resources to protect employees. The most frequently mentioned solutions implemented were security alarms, fog cannons, CCTV cameras and increased police presence. Of the numerous solutions suggested, the most favoured was harsher penalties for offenders, particularly for youth. There was a distinct lack of compassion expressed towards retailers, people who smoke or offenders. Attitudes varied depending on the commentators' role. **Conclusion:** Crime and injury associated with illicit tobacco trade represent an increasing problem for public health. Lack of evidence or lack of agreement about the determinants of harm will likely prevent the development of effective solutions.

FUNDING: Nonprofit grant funding entity

**P-77****HEALTH CONCERNS ABOUT E-CIGARETTE USE AND REACTIONS TO E-CIGARETTE RELATED POLICIES AMONG YOUNG ADULT E-CIGARETTE USERS**

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Significance. Despite recent movement toward implementing e-cigarette related sales restrictions (e.g., flavored products or all together), policy support and potential impact on use behaviors among young adult e-cigarette users are not well-documented. **Methods.** We analyzed Wave 4 (W4; Feb-May 2020) data from a two-year, five-wave longitudinal study of young adults (aged 18-34) in 6 metropolitan areas (Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, Seattle). We examined e-cigarette related policy support and potential policy impact on e-cigarette and traditional cigarette use among e-cigarette users (n=550; M_{age}=24.86±4.65; 44.0% male, 4.0% Black, 11.3% Asian, 11.8% Hispanic), as well as key correlates (e-cigarette related negative health symptoms and concerns). **Results.** Multivariable regression indicated that correlates (p<.05) of greater negative symptoms were being younger, Black (vs. White), Hispanic, younger at first use, and less frequent use (aR²=.068); greater health concern correlated with being heterosexual, fewer days of use, using closed system devices, and greater symptoms and social/media influences emphasizing negative effects (aR²=.072). Regarding policy, 24.2% strongly/somewhat supported restricting flavored vape products; 15.1% supported restricting all vape product sales. If policy was implemented to restrict vape products to tobacco flavor only, 39.1% reported being very/somewhat likely to continue to use e-cigarettes (30.5% not at all likely); 33.2% reported being very/somewhat likely to switch to cigarettes (45.5% not at all). If all vape product sales were banned, equal numbers (~39%) were very/somewhat vs. not at all likely to switch to cigarettes. Correlates of greater policy support were being heterosexual, being Black or Asian, fewer days of use, using closed systems, and greater symptoms and health concerns (aR²=.398); greater positive policy impact correlated with being older, female, heterosexual, Black, fewer days of use and greater health concern (aR²=.359). **Conclusions.** As e-cigarette related policies are considered and implemented, surveillance of impact on young adult e-cigarette and other tobacco use is critical.

FUNDING: Federal

P-78**VAPE SHOP & CONSUMER ACTIVITY DURING STATE COVID-19 STAY-AT-HOME ORDERS IN 6 US METROPOLITAN AREAS**

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Significance. Despite risks that vaping poses for lung health, one study found that vape shops did not comply with business closures in southern California. Beyond this, little is known about vape retail practices and purchase/quit behaviors during COVID-19 stay-at-home orders. **Methods.** We report data from a longitudinal study of vape shops and young adults (ages 18-34) in 6 metropolitan areas (Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, Seattle). We used multiple data sources: 1) legal research to determine whether vape shops were required to be closed as nonessential businesses by state orders; 2) phone- and web-based surveillance to assess retail practices for a sample of 156 vape shops in March-June 2020; and 3) a concurrent online survey of 354 e-cigarette users about experiences with vape retail. **Results.** Vape shops were declared nonessential businesses in 4 of the 6 states (except in GA and OK; in OK, they were considered nonessential for a brief period). Timing/duration of mandated closures varied (start dates: 3/19 in CA to 3/27 in MN; end dates: 4/1 in OK when vape shops declared essential to 6/8 in MA when business restrictions were lifted). Surveillance analysis focused on the 5 metropolitan areas in states with orders mandating vape shop closures during any time period. Of 156 vape shops, 53% were open as usual (range: 100% in San Diego to 22% in Minneapolis); 12% were permanently closed, 4% were temporarily closed, and 31% offered pick-up and/or home delivery. Among survey respondents (M_{age}=23.9±4.6; 47% male, 4% Black, 13% Asian, 13% Hispanic), 27% worried their vape shop would close/go out of business during COVID-19; 7% said their vape shop did so. Few respondents noticed increases in vape product home delivery options (7%), discounts/price promotions (10%), and/or prices (9%). Regarding purchase and quit behaviors, 20% stocked up on vape products, 20% tried to reduce use, and

16% tried to quit. **Conclusions.** Some vape shops remained open during nonessential business closures; information about local laws would be helpful to interpret compliance. E-cigarette users were as likely to stockpile vape products as to try to reduce/quit use.

FUNDING: Federal

P-80**IS HIGHER DENSITY OF OR CLOSER PROXIMITY TO TOBACCO RETAIL OUTLETS RELATED TO CIGARETTE/ E-CIGARETTE USE IN YOUTH AND ADULTS? A SCOPING REVIEW**

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SIGNIFICANCE: States and localities are formulating strategies to reduce the widespread retail availability of tobacco products. However, evidence of associations between tobacco retail density/proximity and smoking outcomes (prevalence, initiation, cessation and relapse) is mixed, possibly due to methodological differences between studies. Previous literature reviews focused on smoking in youth and young adults and did not include e-cigarette use. We conducted a scoping review on retail availability and cigarette/e-cigarette use in youth and adults, and considered different measures of retail density, proximity and smoking outcomes across studies. **METHODS:** A systematic search for studies examining the association between outlet density/proximity and youth and adult smoking or vaping was conducted across MEDLINE (PubMed), Web of Science and Google Scholar through February 26, 2020. **RESULTS:** Thirty six studies were included in our qualitative synthesis. While there are differences in neighborhood definitions (e.g. ego-centric versus administrative unit), there is evidence for a positive association between higher outlet density in residential ego-centric neighborhoods and current smoking in adults (three of three studies) and current and lifetime smoking in adolescents (two of two). Administrative unit measures showed limited evidence of an association with adult (one of two) and adolescent (one of four) current smoking and lifetime smoking (two of three). Studies on residential proximity obtained inconclusive results. Density and proximity of tobacco outlets around schools mainly showed no or inverse association with adolescent smoking, however, evidence suggests higher susceptibility to smoking (two of two). Findings for an association between retail availability and e-cigarette use were inconclusive due to a small number of studies. **CONCLUSION:** The current literature provides limited empirical evidence of the association between higher density of and closer proximity to tobacco retail outlets with smoking or vaping. More research with uniform measures of environmental exposure to tobacco outlets is needed to allow for greater comparability between studies.

FUNDING: Federal

P-81**INTENTIONS AND FUTURE PLANS TO QUIT VAPING AMONG E-CIGARETTE USERS IN THE US AND UK**

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Background: The United States (US) and the United Kingdom (UK) have different approaches to e-cigarette policy. This study describes intentions to quit among e-cigarette users in both countries and determines whether country-level differences exist when controlling for individual-level factors. **Methods:** We used the online crowdsourcing platform Prolific to survey current e-cigarette users living in the US and UK. Measures were drawn from existing international surveys and included intention to quit, future plans to quit, sociodemographic variables, and mental/physical health. Analyses used Fisher's Exact test two sided and logistic regression. **Results:** The study included 1064 participants (535 UK; 529 US). Mean age was 34.7 years old; most were male (51%), white (85%), had bachelor's degree or above (55%), and were employed (75%). Most of UK (62%) and US (61%) respondents intended at some point in time to stop using e-cigarette for good; this difference was not significant and remained non-significant after controlling for social and demographic factors. Controlling for country, intention to ever stop was significantly correlated with increasing age (OR 1.01; p=.010), being unemployed (OR 2.45; p=.000), and non-daily use of e-cigarettes (OR 1.29; p=.060). Future plans to quit were significantly different (p<.001) between countries and were as follows: plans to stop in the next 7 days: 3% (US) versus 1% (UK); in the next 30 days: 11% (US) versus 4% (UK); in the next 6 months: 27% (US) versus 17% (UK) in the next year: 33% (US) versus 42% (UK); and in more than a year 26% (US) versus 37% (UK). These differences remained significant in adjusted analyses (p>.001).



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Conclusions: Although most vapers in both countries intended to quit at some time in the future, US respondents planned to quit sooner than UK respondents. This may be due to several factors including country norms related to vaping, UK policies favoring the use of e-cigarettes as a cessation aid, US policies related to e-cigarette regulation, and the epidemic of e-cigarette related lung disease in the US.

FUNDING: Federal; Academic Institution

P-82

THE RELATIONSHIP BETWEEN TOBACCO 21 POLICIES AND RETAILER COMPLIANCE

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Introduction: Tobacco 21 (T21) policies raise the minimum legal sales age (MLSA) of tobacco products, but in order to be effective, they must be enforced by retailers. This study evaluated the relationship between local T21 policies and retailer violation rates (RVR) across the US. **Methods:** Local T21 policies (n=271) were retrieved online through searches for local ordinances, municipal codes, or through the local clerk of each policy location. Policy components such as tobacco retail license [TRL] suspension or revocation and violation rates were coded using a validated T21 assessment tool. Municipality size, obtained from US Census data, was combined with retailer compliance data (e.g., violations, inspections, type of product sold during violations) obtained from the FDA Compliance Check database. Violation rates before and after T21 policy implementation were examined using a dependent t-test. Two one-way ANOVAs were conducted to examine differences in RVRs between based on municipality size, and independent t-tests were employed to examine differences in RVRs when the policy included suspension or revocation of a TRL. **Results:** Significant differences were found between groups' violation rates after policy implementation and population size (F[5,248] = 3.97, p=0.002). Communities with between 5,001-10,000 (M=0.03, SD=0.05) citizens reported significantly fewer violations than communities with 50,001-150,000 people (M=0.08, SD=0.07, p=0.029) and with 150,001 or more people (M=0.11, SD=0.08, p=0.029). Policies that did not suspend retailers TRL due to violation of the policy (M=0.09, SD=0.08) had significantly higher RVRs after implementation of the T21 than those that did (M=0.05, SD=0.06), (t(75.5)=3.022, p=0.003). Policies that did not revoke a TRL following violation of the policy (M=0.07, SD=0.07) had significantly higher RVRs after policy implementation than those that did (M=0.05, SD=0.06; t[180.26]=2.12, p=0.035). **Conclusions:** The inclusion of recommended policy components (e.g., monetary penalty structures and suspension/revocation of TRL) within T21 policies is important to ensure the enforcement of these policies. Densely populated areas are encouraged to increase the frequency of compliance checks conducted in order to reduce access to tobacco products to those under 21.

P-83

EVIDENCE TO INFORM E-CIGARETTE REGULATORY POLICY

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Significance In response to rapid increase in use by non-smoking youth, jurisdictions are adopting a wide array of policies to regulate e-cigarette products, flavors and marketing. Evidence about the effectiveness, feasibility and viability of these policies is scarce. The purpose of this study was to facilitate evidence-informed e-cigarette regulatory policy. **Methods** Global jurisdictional scans were conducted to collect data about policies adopted by jurisdictions. Scoping reviews identified evaluative research about the effects and of feasibility and viability challenges of implementing these policies. To supplement, likely effects were extrapolated from tobacco and other substances literature. **Findings** Twenty-two regulatory options were identified and assessed, as follows: Nine policy options for product regulation: 1) Sales regulations: Ban e-cigarette sales outright; Ban recreational sales/restrict to medicinal use; 2) E-liquid regulations: Ban nicotine e-cigarettes; Limit nicotine concentration; Limit size of cartridges/refills; Prohibit protonated nicotine/ban additives that facilitate inhalation; 3) E-cigarette mechanism regulations: Limit power (heat); Regulate length of puff; Allow only closed systems. Seven regulatory policy options for flavors: Ban all flavors including menthol; Ban flavors excluding menthol; Ban flavors with additional exceptions (e.g. fruit + menthol); Ban flavors in closed systems only; Restrict flavors to adult stores only; Allow flavors only in medicinal products available to smokers; Allow all flavors Six regulatory policy options for marketing: Restrict to not youth appealing; Industry self-regulation; Restrict to adult only venues and channels/targeted marketing to smokers; Partial marketing bans; prohibit broadcast advertising, billboards; Comprehensive ban **Conclusion** A wide selection of regulatory policies are available with varying likelihoods of success in

curtailing e-cigarette use by young non-smokers and of supporting the use of e-cigarettes as a potential cessation support for smokers. Evidence of effects, feasibility and viability is sparse and soil for new research is rich.

FUNDING: Other

P-84

ADOLESCENT AND YOUNG ADULT E-CIGARETTE USE BEFORE AND DURING COVID-19

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Significance: Understanding the latest e-cigarette products used, patterns of use and access during COVID-19 is important since e-cigarettes increase risk for COVID-19. We identify device types, brands and flavors used by youth (aged <21 & ≥21) before and since COVID-19 sheltering-in-place went into effect, and since FDA's announcement to prioritize enforcement of non-tobacco/non-menthol flavored "cartridge-based" e-cigarettes. **Methods:** National cross-sectional survey of 13-24 year olds in May 2020 (n=4,351; 50% e-cigarette ever users) assessed e-cigarette ever- and past-30-day use (pod-based, disposable, others), brands, flavors and flavor-enhancers, and change in amount used (increase, decrease, quit, switch, no change) before and since COVID-19. **Results:** Ever-use was highest for pod-based devices (mostly Juul) (82.7%<21; 69.8%≥21), with 41% using these devices most often (41.9%<21; 41.4%≥21). Past 30-day-users (50.8%<21; 61.9%≥21) and 7-day-users (36.0%<21; 56.7%≥21) used disposables (mostly Puff Bar) more than other device types. Mint/menthol was the most-used flavor (pod-based: 58.3%<21, 63.7%≥21; disposable: 73.0%<21, 82.7%≥21), then fruit (pod-based: 37.4%<21, 35.5%≥21; disposable: 51.6%>21, 46.2%≥21), and sweet/dessert/candy (pod-based: 27.1%<21, 31.5%≥21; disposable: 39.9%<21, 47.5%≥21). Add-on flavor-enhancers were used by one-third of users. Since COVID-19, most e-cigarette users changed their use: 1/3rd quit, 1/3rd reduced amount, and few switched to other forms of nicotine or cannabis; 18-19% of participants shifted from retail to online purchases, 18-24% shifted type of retail store, 2% shifted from online to retail, 34-46% continued with the same retail location and 13-17% continued with online purchasing as before COVID-19. E-cigarette users were 51% less likely to quit if they were nicotine dependent (95%CI 0.35, 0.70). **Conclusions:** Youth use of flavored e-cigarettes, particularly disposables and mint/menthol, grows as companies exploit loopholes in FDA regulation and enforcement. COVID-19-related stay-at-home orders have directly impacted youth e-cigarette use and access. Policy-makers should enact laws prohibiting all flavors and underage sales of e-cigarettes.

FUNDING: Federal; Other

P-85

LONGITUDINAL TRENDS IN TOBACCO AND VAPE RETAIL DENSITY IN CALIFORNIA (2015-2019)

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Introduction: Identifying the changes in the retail density of specialized tobacco and/or vape shops and general tobacco vendors can help understand trends in the density of retail markets and inform effective policy approach to reduce the availability of tobacco. **Objectives:** To compare the longitudinal trend in retail density between tobacco-specific storefronts, vape-specific storefronts and non-specific tobacco retailers. **Methods:** Data on licensed tobacco retailers within California from 2015-2019 was obtained from the California Department of Tax and Fee Administration. Change in retail store density (new licenses) for tobacco- and/or vape-specific storefronts and general retail stores. Vendors tobacco store type was categorized and annotated using Yelp!, a crowd-sourcing business directory service. Geolocations were aggregated at the zip code level for visualizing and analyzing trends in geospatial density. **Results:** The tobacco retail density for all store categories increased from 2015 to 2019. However, the percent increase in the number of vape-specific storefronts was highest in the years 2016 (105%) and 2017 (79%). The number of new licenses for most vendor categories issued per year increased from 2015-2017, followed by a decrease in 2018. However, stores selling both tobacco and vape continued to increase in 2018 (58%). The vape-specific stores had the highest increase in number of new licenses issued in the year 2016 (500%). When aggregating the stores based on geolocation, clustering was observed in the counties of Los Angeles, San Diego, Sacramento and San Francisco for all tobacco and/or vape specific storefronts from 2015-2019 with increasing density. **Conclusions:**



Monitoring the distribution of tobacco retail density for change over time using online descriptions with Yelp can help identify the type, location, and point-of-sale marketing exposures to tobacco products.

FUNDING: State

P-87

INDIVIDUAL AND POLICY CORRELATES OF E-CIGARETTE USE AMONG ADULT SMOKERS IN 30 MAJOR US CITIES

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Background: About 9 million US adults use more than one tobacco product, most commonly combustible and electronic cigarettes. We examined individual and policy correlates of e-cigarette use among adult daily smokers (ages 21-59) in 30 major US cities. **Design:** Cross-sectional online survey of n ≥80 adult daily smokers per city, collected Dec 5, 2019-Mar 3, 2020. **Sample:** The sample (N=2583; 53.5% male; 39.7% with a college degree; 74.5% employed; 73.2% White) averaged 12.5±8.2 cigarettes/day and reported their past 30-day e-cigarette use as every day (17.7%), some days (38.1%), or not at all (44.2%). Most (77.3%) smoked within 30 min of waking; 24.5% made a 7-day quit attempt (from all tobacco) in the past 6 months; 30% resided in a city that restricts flavored tobacco sales; cigarette tax averaged \$2.55 per pack (R: \$0.17-\$7.16). **Analyses:** Generalized estimating equations (individuals nested within cities) tested differences in e-cigarette use in a multinomial ordinal logistic model adjusting for individual and city-level correlates. **Results:** E-cigarette use was associated with being male (AOR=1.45, 95%CI:1.24-1.71), White (AOR=1.21, 95%CI:1.01-1.46), younger (AOR=0.96, 95%CI:0.95-0.97), completing college (AOR=1.61, 95%CI:1.33-1.95), employment (AOR=1.50, 95%CI:1.21-1.85), higher income (AOR=1.12, 95%CI:1.07-1.18), smoking within 30 min of waking (AOR=1.37, 95%CI:1.14-1.66), greater desire to quit smoking (AOR=1.05, 95%CI:1.02-1.08), and quitting for 7-days in the past 6 months (AOR=1.77, 95%CI:1.47-2.14), but not with smoking fewer cigarettes (OR=1.00, 95%CI:0.99-1.01). E-cigarette use was positively associated with cigarette tax (AOR=1.12, 95%CI:1.05-1.20) and was less likely in cities with flavor restrictions (AOR=0.75, 95%CI:0.60-0.94). **Conclusions:** Among adult daily smokers in 30 major US cities, a majority reported past month e-cigarette use. Adjusting for demographics, e-cigarette use was associated with greater cigarette dependence, greater desire to quit smoking, recent quit attempts, and higher cigarette taxes, but not with smoking fewer cigarettes. Use of e-cigarettes among daily smokers was less likely in cities where flavored tobacco sales were restricted.

FUNDING: Federal

P-88

PRODUCT STANDARDS FOR POTENTIAL REDUCED RISK TOBACCO PRODUCTS

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In 2017, FDA announced the Comprehensive Plan for Tobacco and Nicotine Regulation that included recognition of a continuum of risk among various nicotine-containing products. Then-FDA Commissioner Gottlieb stated FDA policy should "move addicted smokers down that continuum of risk to these less harmful [innovative] products." For tobacco harm reduction to be successful, we must first have a diverse marketplace of FDA-authorized potential reduced risk products (RRPs). Science and evidence-based regulation, including product standards may accelerate market authorization of RRP and thereby benefit public health. Here, we recommend product standards for potential RRP categories such as Oral Tobacco Derived Nicotine (OTDN) products, Heated Tobacco Products (HTPs), and Electronic Nicotine Delivery Systems (ENDS). Ideally, product standards emphasize product safety, as well as achievable and efficient authorization pathways. In summary, we propose the FDA lead a national dialogue with all stakeholders, including public health, consumers and manufacturers, to develop and implement product standards for reduced risk product categories.

FUNDING: Tobacco Industry

P-89

THE IMPACT OF BANNING ENDS PRODUCTS ON COMBUSTIBLE CIGARETTE SALES: INITIAL EVIDENCE FROM US STATE-LEVEL POLICIES

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OBJECTIVES: In fall of 2019, several states in the US passed short-term bans on the sale of Electronic Nicotine Delivery Systems (ENDS), partially in response to an outbreak of illnesses tied to THC vaping products that received national news coverage. As ENDS products are alternatives for adult smokers to switch away from cigarettes, there may be unintended consequences in banning ENDS. We provide evidence of the impact of state-level ENDS bans on cigarette sales. **METHODS:** We utilized a Generalized Synthetic Control model to predict counterfactual cigarette sales for states that passed ENDS bans in fall 2019 (Massachusetts [MA], Washington [WA], and Rhode Island [RI]), based on synthetic weights derived from control states that did not pass such bans. The primary outcome was weekly per capita cigarette sales, as captured in syndicated commercial sales data. State-level control variables that affect tobacco product sales, including smoking prevalence, tobacco taxes, temperature, inflation, unemployment and ENDS sales, were included in the model. Linear interactive fixed effects were used to allow state intercepts to interact with time-varying coefficients. **RESULTS:** Cigarette sales in ban states were significantly higher than would have been observed otherwise in the post-ban period. A full ban on ENDS products increased overall weekly per capita cigarette sales by 8.3% in MA (p<0.001); banning flavored ENDS products resulted in higher than expected cigarette sales in WA (4.6%), and RI (5.0%) (p<0.001). Menthol cigarette sales were also higher (12.3% in MA, 6.5% in WA and 7.1% in RI; p<0.001) than expected in ban states. States that passed a ban that was revoked (Oregon and Michigan) showed no difference in observed cigarette sales in the same period. Results were robust to a number of specification checks. Overall, the model suggests that approximately 3 million additional cigarette packs were sold in ban states during ban periods than would have been otherwise. **CONCLUSIONS:** This study provides some of the first evidence that banning ENDS products may have unintended consequences. Future research is needed to understand the longer-term impact of these policies.

FUNDING: E-cigarette/Alternative nicotine products Industry

P-90

SAVING 8 MILLION LIVES - GETTING THE FDA'S COMPREHENSIVE PLAN FOR TOBACCO AND NICOTINE REGULATION BACK ON TRACK

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In July 2017, the US FDA announced their roadmap to avert 8 million premature deaths over this century—deaths caused by smoking cigarettes. The foundation of FDA's plan was that nicotine is delivered by wide range of products that carry a wide range of toxicities and harms: from cigarettes delivering thousands of chemicals and hundreds of toxins all the way to nicotine medications such as patch and gum, which FDA has judged to be so safe that they've been available without a doctor's prescription for almost 25 years. FDA laid out their intention to use their regulatory powers to move smokers away from combustible products to nicotine products that do not burn - transforming the nicotine marketplace. FDA's tandem approach to advance this transformation was to use their product standard authority to set a maximum level for nicotine in cigarettes so that cigarettes could no longer create or sustain addiction, while fostering the development of noncombustible nicotine products for those who were still seeking nicotine. As promising as this plan remains, over three years in, we are *further* away from that life-saving destination than we were in 2017. This presentation will review the wide range of potential reasons for our lack of progress and attempt to describe useful themes and draw relevant implications. The talk will conclude with potential steps to foster discussion and progress to get back on track to saving 8 million lives.

FUNDING: E-cigarette/Alternative nicotine products Industry



P-91

E-LIQUID INGREDIENT SAFETY - DEVELOPING A EUROPEAN TECHNICAL STANDARD

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Within the European standards organisation, the working group (WG) on e-liquids (CEN437/WG3), is developing proposed ingredient requirements. The recent EVALI events in the US, attributed to inappropriate ingredients in e-liquids, has further increased the interest in this subject. In drafting technical standards, industry, regulators, consumers and other stakeholders cooperate to translate science and best practice into workable guidelines. Here we present considerations of the WG to define a practical and enforceable approach to ensuring consumer safety of e-liquid ingredients. Specifically, should the standard require case by case toxicological risk assessments (TRA) or set ingredient-specific restrictions? A TRA for each ingredient in each e-liquid, taking into account the various vaping devices it could be used in, would be the best scientific approach. However, with great variation in resources and knowledge available to regulators and producers, TRA quality would be variable and not guarantee minimum consumer protection levels. Specific ingredient restrictions are much simpler but bring their own challenges: positive lists inhibit innovation, negative ingredient lists can never be comprehensive. And neither list approach addresses the essential dose aspect of any risk assessment. Restricting a positive list further by defining pre-set level restrictions centrally would be challenging given the breadth of devices, and risk no longer being appropriately protective by the time of publication. Therefore the WG favours a combination approach. Besides requiring a TRA for each ingredient, additional specific requirements are set. These focus on the purity of ingredients, and both a "functional" and a specific negative list. The "functional" negative list excludes ingredients with certain roles, toxic properties or that are on specific external lists from scientific committees. The specific list highlights ingredients or properties that have been shown to cause issues when used in vaping products.

FUNDING: Unfunded; E-cigarette/Alternative nicotine products Industry; Tobacco Industry; Other

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